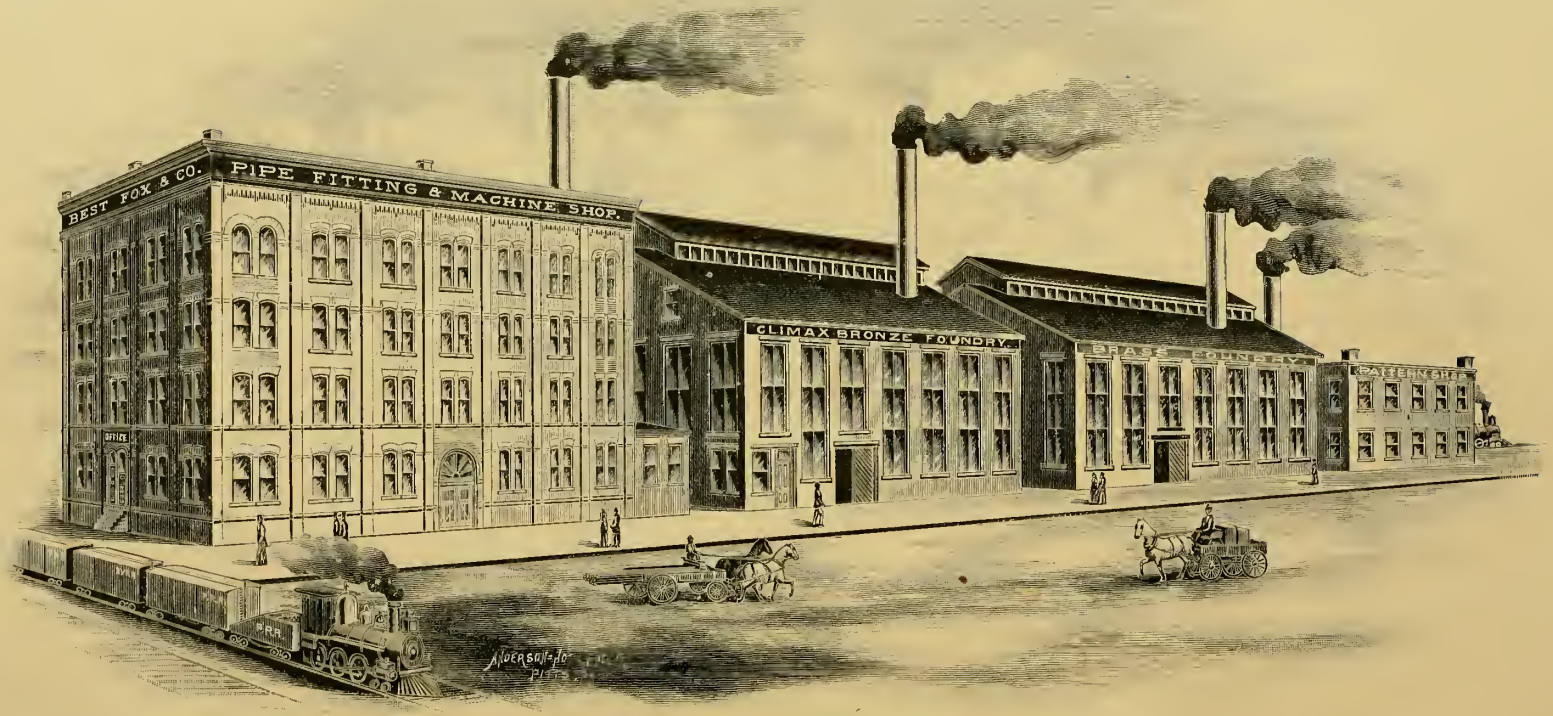
BEST, FOX & CO.

PITTSBURGH, PA.

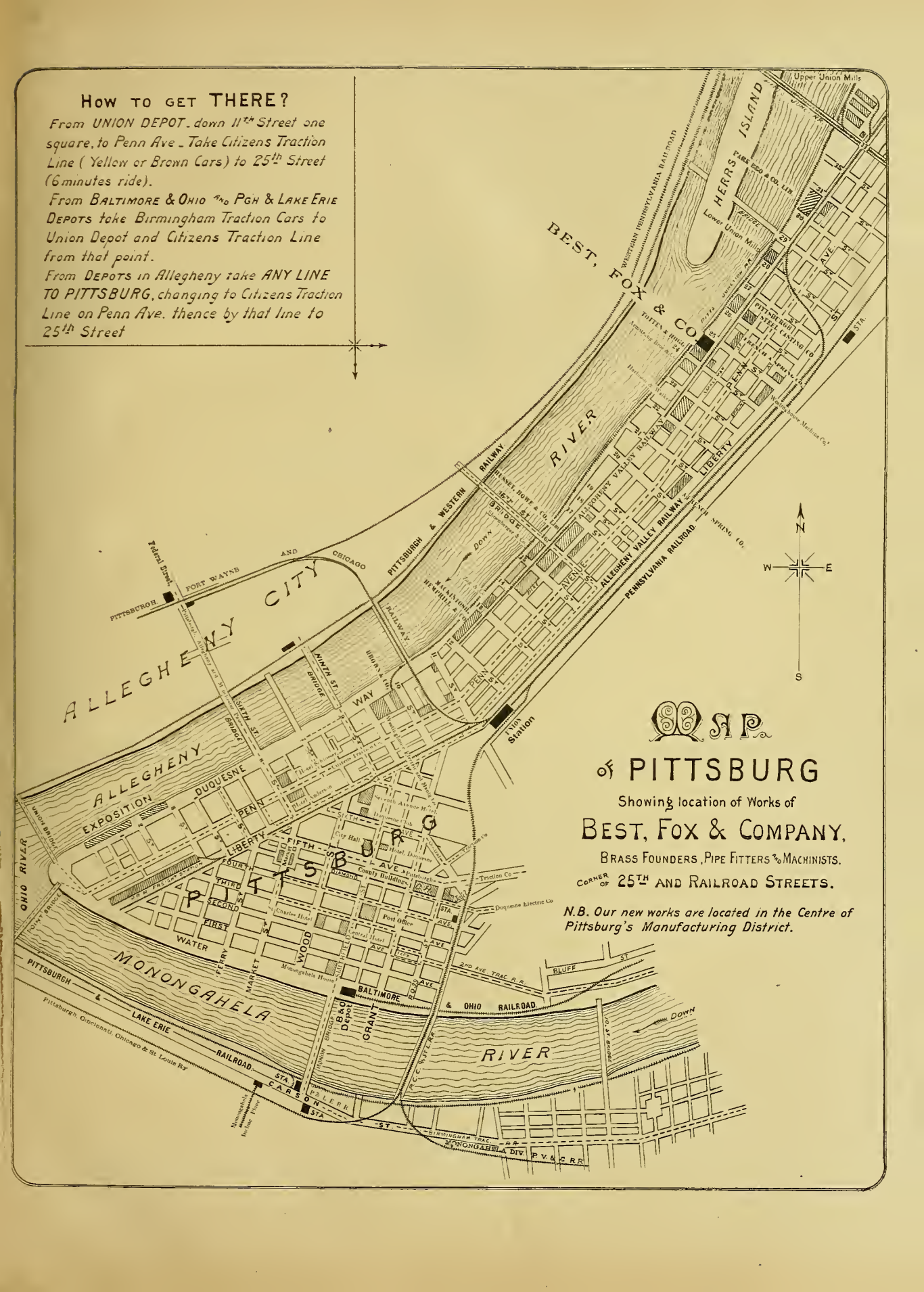
1894.

0 014 639 895 9
LIBRARY OF CONGRESS

REGISTER No. 2138



54,000 Square Feet, or 1¼ Acres Floor Space.


How to get THERE?
From UNION DEPOT, down 11th Street one square, to Penn Ave. Take Citizens Traction Line (Yellow or Brown Cars) to 25th Street (6 minutes ride).
From Baltimore & Ohio and Pgh & Lake Erie Depots take Birmingham Traction Cars to Union Depot and Citizens Traction Line from that point.
From Depots in Allegheny take ANY LINE TO PITTSBURG, changing to Citizens Traction Line on Penn Ave. thence by that line to 25th Street
BEST, FOX & CO
RIVER
ALLEGHENY CITY
PITTSBURGH
Federal Street
PITTSBURGH & WESTERN RAILWAY
FORT WAYNE AND CHICAGO
ALLEGHENY VALLEY RAILWAY
PENNSYLVANIA RAILROAD
HERRS ISLAND
Upper Union Mills
Lower Union Mills
SPRING GARDEN AVE
LIBERTY
PENN AVENUE
NINTH ST BRIDGE
SIXTH ST BRIDGE
WAY
Union Station
ALLEGHENY
EXPOSITION
DUQUESNE
PENN
LIBERTY
FIFTH AVE
PITTSBURG
THIRD
SECOND
FIRST
WATER
WOOD
MARKET
FERRY
GRANT
BALTIMORE & OHIO RAILROAD
BALTIMORE
BLUFF ST
2nd AVE. TRAC. R.R.
Duquesne Electric Co
Traction Co
Post Office
City Hall
County Buildings
Monongahela House
Central Hotel
Charles Hotel
Diamond
Union Bridge
Point Bridge
OHIO RIVER
MONONGAHELA
PITTSBURGH & LAKE ERIE RAILROAD
Pittsburgh, Cincinnati, Chicago & St. Louis Ry
CARSON ST
P. & L. E. R.R.
P.C.C. & St. L. R.R.
10th St. Bridge
BIRMINGHAM TRAC. R.R.
MONONGAHELA DIV. P.V. & C. RR
DOWN
N
S
E
W
MAP
of PITTSBURG
Showing location of Works of
BEST, FOX & COMPANY,
BRASS FOUNDERS, PIPE FITTERS & MACHINISTS.
CORNER OF 25TH AND RAILROAD STREETS.
N.B. Our new works are located in the Centre of Pittsburg's Manufacturing District.

TRADE MARK.

CABLE ADDRESS *"BESTFOX"* PITTSBURGH.

LONG - - - DISTANCE

TELEPHONE PITTSBURGH.

DIRECT COMMUNICATION TO ALL POINTS.

TELEPHONE AND TELEGRAPH MESSAGES

RECEIVE PROMPT ATTENTION AT

ALL HOURS, DAY AND **NIGHT.**

COPYRIGHTED 1894.

PRESS OF J. B. SAVAGE.
CLEVELAND, O.

ESTABLISHED 1884.

GEORGE BEST. DANIEL FOX. WM. H. H. SHEETS.

BEST, FOX & CO.,

BRASS FOUNDERS, IRON PIPE FITTERS

AND

MACHINISTS.

. . . . . .

SOLE MANUFACTURERS OF

CLIMAX BRONZE,

ALSO

VALVES AND FITTINGS.

. . . . . .

DEALERS IN

PIPE, FITTINGS AND SUPPLIES

FOR ALL PURPOSES.

Pipe from $\frac{1}{8}$ to 24 Inch Diameter Bent to Order.
Heavy Pipe Work a Specialty.
Erected in All Parts of the World.

OFFICE AND WORKS,

TWENTY-FIFTH & RAILROAD STS. & ALLEGHENY RIVER,

PITTSBURGH, PA., U.S.A.

CATALOGUE F.

1894.

ESTABLISHED 1884.

ANNOUNCEMENT.

FIRST CATALOGUE.

IT IS WITH PLEASURE that we present our first Illustrated Catalogue to our friends, and hope it will prove to be of value to them.

The illustrations show the principal articles we manufacture and handle. We invite enquiries for anything in the pipe fitting, machine or brass foundry line that may be wanted and is not shown.

TEN YEARS OLD.

Ten years ago we began business in a small shop. Reliable work and prompt delivery have increased our business to such an extent as to require the large buildings shown in which to execute our work.

NEW SHOPS.

CAPACITY.

Our new fitting and machine shop, and brass and bronze foundries, are among the largest and best equipped in the country. We make bronze castings weighing from 1 oz. to 12,000 lbs., of any character, and lead the world in Bronze Cooling Specialties for Blast Furnaces.

LARGE PIPE BENDING.

Our equipment for making valves and fittings from 48 inches down is complete, and our power appliances for bending wrought and steel pipes are not equalled anywhere.

We have experienced fitters to erect pipe work in all parts of the world.

PLANS.

Plans and specifications submitted for any work in our line.

SHIPPING FACILITIES.

With sidings from Pennsylvania R. R. system directly in front of our property, and from the Baltimore & Ohio immediately in the rear, (and property also abutting on the Allegheny river) we have unsurpassed shipping facilities.

We will use the same diligence and zeal that achieved our past success to retain and increase our business in the future.

We thank our many friends for past favors, and shall endeavor to merit future orders from old and new customers by prompt and careful attention to all business entrusted to us.

Sincerely,

BEST, FOX & CO.

Pittsburgh, Pa., October 1st, 1894.

INDEX.

A

PAGE.

Air Cocks 44
" Pumps 80
" Valves, Automatic 66
Aluminum 89
Ammonia Fittings and Valves 22
" Gauges 22, 55
Angle Valves, Ammonia 22
" Brass 37, 38
Hydraulic 53
" Iron Body 22, 26
Armstrong Die Plates 73
Asbestos Covering 87
" Disc Gate Valves 33
" Discs 38
" Hydraulic Cocks 51
" Packed Cocks 34
" Valves, Brass 38
" " Iron Body 26
Ashton Pop Safety Valves 57
Automatic Air Valves 66
" Cylinder Cocks 78
" Gauges 22
Ajax Oil Cups 47

B

Babbitt Metals 89
Back Pressure Valves 35
Balanced " 52
Base Fittings 14, 17
Baxter S Wrenches 76
Bearings, Bronze and Brass 88
Bells 89
Belts 86
Bends, Pipe 7
Berryman Heaters 64
Best's Wedge Gate Valves ..... 28—30
Bingham Gauge Cocks 44
Blake's Pipe Hangers 68
Blast Gates 60
" Gauges, Mercury 55, 57
Blind Flanges 15
Blocks, Tackle 69
" Weston's Pulley 69
Blow-off Valves 35
Boiler Tube Cleaners 70
" " Expanders 70
" Tubes 2, 4
Boilers 79
Bolts 72
Bosh Boxes, Bronze 92
" Plates, " 93, 94
Bowl Fittings 21
Box Coils 66
Boxes, Bronze Bosh 92
" Valve 60
Brackets 50
Branch Tees 14, 22
Brass Castings 88, 89
" Cocks 41
" Expansion Joints 41
" Fittings 43
" Oil Cups 47
" Pipe 2
" Safety Valves 40
" Unions 42
" Valves ..... 37—40
Brasses 88
Brock's Chain Tongs 75
Bronze Castings 88, 89
" Climax 98
" Tuyeres, Coolers, etc ..... 90—95
Brown's Adjustable Tongs 75
" Pyrometers 56
Brushes, Flue 70
Buffalo Duplex Steam Pumps ..... 79—82
Burners, Gas 50
" Oil 78
Bushings, Brass 43
" Cast Iron 13
" Malleable 9
Butterfly Valves, Brass 41
" " Iron Body 27
By-pass Cocks 31
" Fitting 96

C

Caldwell Straps 49
Caps, Bowl 21
" Brass 43
" Cast Iron 13
" Malleable 9
Car Brasses 88
Casing 2
Cast Iron Fittings ..... 12—14
" Flanges 15, 19
" Pipe, Bowl and Flanged 1
" " Fittings 21
Cast Steel Flanges 15
Castings, Bronze and Brass 88, 89
Centre Cocks 49
Centrifugal Pumps 78
Chain 69
Champion Feed Water Heater 64
Chapman Gate Valves 32
" Steam Traps 63
Check Valves, Ammonia 22
" Brass 37, 38
" Iron Body 23
Chime Whistles 45
Chronometer Valves 58
Climax Babbitt Metals 89
" Bronze, Ingot 98
" " Castings 88, 89
" " Tuyeres, etc ..... 90—95
" Gate Valves 27, 28
" Hydraulic Valves 52
" Oil Burners 78

INDEX.—CONTINUED.

PAGE.

Climax Steam Separators 62
" Globe, Angle and Check Valves ..... 23—25
Clocks 55
Cock Wrenches 41
Cocks, Air 44
" Asbestos Packed 34
" Brass 41
" Cylinder 44, 78
" Gauge 44
" Hydraulic 41, 51
" Iron 34
" Tuyere 42
Cody Oil Cups 47
Coil Stands 14
Coils, Heater 65, 66
Coke Oven Valves 37
Collars, Shafting 71
Columns, Reliance Safety 46
" Water Gauge 46
" Williams' Safety 46
Compression Gauge Cocks 44
Condenser Heads, Exhaust 63
Condensers 60, 80
Consolidated Pop Safety Valves 57
Coolers, Climax Bronze 91, 92
Copper Expansion Joints 35
" Floats 77
" Gaskets 62
" Hammers 77
" Pipe 2
" " Flanges 15
" Rods 89
" Sheets 89
Corrugated Copper Expansion Joints 35
" " Gaskets 62
Couplings, Ammonia 22
" Brass 43
" Hose 49
" Shafting 71
Covering, Pipe 87
Crabs 69
Crane Low Water Alarm 46
" Unions 8
Critchlow Hydraulic Valves 54
Crosby Pop Safety Valves 57
" Water Relief " 54
Cross Valves, Brass 37, 38
Crosses, Ammonia 22
" Bowl 21
" Brass 43
" Cast Iron 12
" Flanged ..... 16—18
" Hydraulic 51
" Long Sweep 13, 14
" Malleable 9, 10
Crown Oil Cups 47
" Water Meters 59
Cups, Oil 47
Curtis' Regulating Valves 58
Curved Flanges 15
Cutter Wheels 74
Cutters, Barnes 74
" Glass Tube 77
" Stanwood 74
Cylinker Cocks 44, 78
Cylinders, Reboring 85

D

PAGE.

Damper Regulators 67
Dean's Die Plates 74
Deep Well Working Barrels 78
Defiance Ejectors 61
Detroit Lubricators 48
Die Plates 73, 74
Discs, Asbestos 38
" Jenkins 39
Double Center Cocks 49
" Elbows, Long Sweep 13, 14
" Y's, Flanged 17
Drills 76
Drip Boxes Bowl 21
Drop Elbows, Mall 9
" Tees, " 9

E

Eccentric Flanges 15
" Tees 16
Ejectors, Defiance 61
Elbow Burner Cocks 49
Elbows, Ammonia 22
" Bowl 21
" Brass 43
" Cast Iron 12
" Flanged 15
" Hydraulic 51
" Long Sweep 13, 14
" Malleable 9, 10
" Union 10
Electrically Welded Joints 20
Engine Repairs 85
Eureka Regulating Valves 58
Exhaust Coudenser Heads 63
" Condensers 60
" Fittings 17
Expansion Joints, Brass 41
" " Iron 35
" Plates 14
Extension Pieces, Mall 9

F

Fairbanks' Gate Valves 33
Feed Water Heaters 64, 65
Fire Hydrants 61
" Pumps 80
Fittings, Ammonia 22
" Bowl 21
" Brass 43
" Cast-Iron ..... 12—14
" Exhaust 17
" Flanged ..... 14—17
" Gas 49, 50
" Hydraulic 51
" Long Sweep 13, 14
" Malleable ..... 8—10
" Railing 10
" Water 60
Fitt's Chronometer 58
Fixtures, Gas 49, 50
Flanged Fittings ..... 14—17
" Long Sweep Fittings 14

INDEX.—CONTINUED.

PAGE.

Flanged Unions 15
Flanges 15, 19, 20
Flue Packing 86
Float 77
Flue Brushes 70
Foot Valves and Strainers 36
Forbes' Die Plates 74
Force Pumps 78, 82
Ford's Heaters 64
Frames, Gauge 56
Fulton Regulators 58, 59

G

Garfield Injectors 61
Garlock's Packing 86
Gate Valves ..... 27—33
" Best's Wedge ..... 28—30
" Brass 40
" Chapman 32
" Climax 27, 28
" Fairbanks' 33
" Hydraulic 53
" Kennedy 32
Gates, Blast 60
Gaskets, Corrugated Copper 62
Gas Burners 50
" Fittings 49, 50
" Fixtures 49, 50
" Meters 59
Gauge Cocks 44
" Frames 56
Gauges, Ammonia 22, 55
" Automatic 22
" Blast 55
" Hydraulic 55
" Mercury 57
" Steam 55
" Vacuum 55
" Water 45
Gem Water Meters 59
Glass Oil Cups 47
" Tube Cutters 77
Glenu's Hydraulic Valves 53
Globe Valves, Ammonia 22
" Brass 37, 38
" Hydraulic 53
" Iron Body 23, 24, 26
Gougs, Trip 70
Goubert Heaters 64
Goveruors, Judson's 57
" Locke's, Pump 67
" Mason's " 58
" Stott's Low Pressure 58
" Waters' 57
Grease Cups 47

H

Hammers 77
Handy Gate Valves 40
Hangers, Plakes Pipe 68
" Shaftiug 71
Harris' Patent Tongs 75
Heater By-pass 96
Heater Coils 65, 66

PAGE.

Heaters, Feed Water 64, 65
" Open Spray 62
" Steam Super 66
Heavy Brass Unions 42
Heine's Separators 63
Hook Plates 14
Hose 86
" Clamps 49
" Couplings 49
" Nipples 49
" Nozzles 49
" Straps 49
Hot Blast Pyrometer 56
Hydrants, Fire 61
" Lewis 61
Hydraulic Cocks, Brass 41, 51
" Fittings 51
" Flanged Unions 15
" Jacks 70
" Pipe 6
" Valves ..... 52—54

I

Independent Lubricators 48
Indicators, Revolution 55, 56
" Tabor's 56
" Tank 57
" Thompson's 56
" William's 46
Ingot, Bronze and Brass 89
Injectors 61
Iron Burner Tips 50
Iron Cocks 34
" Pulleys 71
" Tanks 77

J

Jackets, Bronze Bosh 93
Jacks 70
Jenkins Discs 39
" Gaskets 39
" Packing 86
" Valves, Brass 39
" " Iron Body 26
Judson Governors 57
Junior Lubricators 48

K

Kenuedy Fire Hydrants 61
" Gate Valves 32
Keystone Unions 8

L

Lag Screws 72
Lamps 68
Lava Tips 50
Lead, Pig 89
" Pipe 2
" Sheet 89
Leather Belting 78
Lewis' Hydrants 61
Light Fittings, Flanged 17

INDEX.—CONTINUED.

PAGE.

Liners, Pump 88
Locke's Valves and Regulators 67
Locknuts, Brass 43
" Cast Iron 13
" Malleable 9
Locomotive Oil Cups 47
Long Screws 8
Long Sweep Fittings 13, 14
Lubricators 48
Lunken Gate Valves 40
Lunkenheimer Automatic Cylinder Cocks 78

M

Machine Bolts 72
Machinists Hammers 77
" Taps 76
Magnabestos Covering 87
Magnesia " 87
Malleable Fittings ..... 8—10
" Unions 8
Manifold Heaters 65
Manifolds 14
Mason's Pump Governors 58
Mercury Gauges 57
Merrill's Regulators 58
Metals, Ingot 89
Meters 59
Metropolitan Injectors 61
Miller's Ratchet Die Plate 73
Mississippi Gauge Cocks 44
Monkey Wrenches 76
Morgan Boxes 60
Myer's Patent Blow-off Valves 35

N

National Heaters 64
" Tube Expanders 70
" Water Filters 60
Natural Gas Burners 50
Necks 15
Nipples, Brass 43
" Wrought Iron 8
Notches, Bronze 91
Nuts 72

O

Offsets 13
Oil Cups 47
" Burners 78

P

Packer Boiler Ratchets 76
Packing 86
" Rings 89
Penberthy Injectors 61
Pendant Cocks 49

PAGE.

Phosphor Tin 89
Pig Lead 89
Pillow Blocks 71
Pinions 88
Pioneer Oil Cups 47
Piston Packing 86
" Rods 88
Pipe Bends 7
" Brass and Copper 2
" Cast Iron, Bowl and Flanged 1
" Covering 87
" Cutters 74
" Fitting Tools ..... 73—77
" Hangers 68
" Hydraulic 6
" Lead 2
" Riveted 2
" Spiral, Welded and Riveted 1
" Steel and Wrought Iron ..... 1—6
" Tables ..... 107—114
" Taps 76
" Tongs 75
" Vises 77
" Wood Water 1
Plates, Bronze Bosh 93, 94
Plugs, Bowl Pipe 21
" Brass 43
" Cast Iron 13
" Malleable 9
Pop Safety Valves 57
Powell's Star Brass Valves 38
Pratt's Traps 63
Pressure Regulating Valves 66, 67
Pulley Blocks 69
Pulleys 71
Pulpits 54
Pump Governors 67
" Liners 88
" Repairs 85
" Valves and Springs 86
Pumps ..... 78—84
" Defiance 61
" Siphon 61
" Triumph 84
Pyrometers, Brown's 56

Q

Quick-opening Gate Valves 27

R

Radiator Valves, Brass 37
Radiators 65, 66
Railing Fittings and Flanges 10
Railings 11
Raised Hole Flanges 15
Ratchet Jacks 70
Ratchets 76
Reamers 76
Reboring Cylinders 85
Receivers, Steam 62

INDEX.—CONTINUED.

PAGE.

Reducers, Bowl ... 21
" Brass ... 43
" Cast Iron ... 13
" Malleable ... 9, 10
Register Gauge Cocks ... 44
Regulators ... 58, 59, 66, 67
Reliance Water Columns ... 46
Relief Valves, Crosby ... 54
Return Bends Ammonia ... 22
" Brass ... 43
" Cast Iron ... 12
" Malleable ... 9
Revolution Indicators ... 55, 56
Rings, Packing ... 89
Rival Oil Cups ... 47
Rivets ... 47
Riveted Pipe ... 2
Robbins' Chain Tongs ... 75
Rod Cups ... 47
Rods, Piston ... 88
Rolled Steel Flanges ... 20
Rope ... 69
Royal Oil Cups ... 47
Rubber Belting ... 86
Rubber Hose ... 86
" Pump Valves ... 86

S

Saddles ... 15
Safety Valves, Brass ... 40
" Iron Body ... 25
" Pop ... 57
Schuff's Regulators ... 66
Screw Jacks ... 70
Seats, Bronze Valve ... 94, 95
Senior Lubricators ... 48
Separators, Steam ... 62, 63
Set Screws ... 72
Shafting and Hangers ... 71
Shaw's Mercury Gauges ... 57
Sheet, Copper and Lead ... 89
Sledges ... 77
Sleeves, Bowl ... 21
Smith's Friction Ratchets ... 76
Snow's Duplex Steam Pumps ... 83, 84
Sockets, Brass ... 43
" Right and Left ... 8
" Wrought Iron ... 8
Soil Pipe ... 1
Spiral Weld and Riveted Pipe ... 1
Spray Heaters ... 62
Springs, Pump ... 86
Stanwood Pipe Cutters ... 74
Steam Exhaust Heads ... 63
Steam Gauges ... 55
" Mercury ... 57
Steam Hose ... 86
" Line By-pass ... 96
" Pipe Covering ... 87
" Pumps ... 78 - 84
" Receivers ... 62
" Regulating Valves ... 58, 66

PAGE.

Steam Separators ... 62, 63
" Super Heaters ... 66
" Traps ... 63
Steel Flanges ... 15, 20
" Necks ... 15
" Pipe ... 1
Stocks and Dies ... 73
Stott's Governors ... 58
Strainers ... 36
" Ammonia ... 22
Stratton Separators ... 63
Stud Bolts ... 72
Super Heaters, Steam ... 66
Swing Joints ... 49
Swing Check Valves ... 25
Switches, Trolley ... 88
Siphon Pumps ... 61
Siphons, Steam Gauge ... 55

T

Tables ... 100 - 114
Tabor's Indicators ... 56
Tackle Blocks ... 69
Tanks ... 77
Tank By-pass ... 96
" Indicator ... 57
" Valves ... 77
Tap Bolts ... 72
Taps ... 76
Tees, Ammonia ... 22
" Bowl ... 21
" Brass ... 43
" Cast Iron ... 12
" Flanged ... 16, 17
" Hydraulic ... 51
" Long Sweep ... 13, 14
" Malleable ... 9, 10
Thompson's Indicators ... 59
Tin ... 86
Tips, Iron and Lava ... 50
Tongs, Pipe ... 75
Tools ... 73—77
Torches ... 68
Transfer Valves ... 27
Traps, Steam ... 63
Trimo Pipe Wrenches ... 75
Trip Gongs ... 70
Triumph Pumps ... 78
Trolley Wheels ... 88
Tube Cleaners ... 70
" Cutters ... 77
" Expanders ... 70
Tuerk's Hose Clamps ... 49
Turn Buckles ... 72
Tuyere Cocks ... 42
Tuyeres, Climax Bronze ... 90, 91

U

Union Elbows ... 10
" Tees ... 10
" Ammonia ... 22

INDEX.—CONTINUED.

PAGE.

Unions, Brass 42
" Crane 8
" Flanged 15
" Hydraulic 51
" Keystone 8
" Malleable 8
" Universal Brass 42
Universal Injectors 61
" Unions 42
Usudurian Packing 86

V

Vacuum Gauges 55
Valve Boxes 60
" Seats, Bronze 94, 95
Valves, Ammonia 22
" Angle Brass ..... 37—39
" " Hydraulic 53
" " Iron Body ..... 23—26
" Asbestos, Brass 38
" " Iron Body 26
" Automatic Air 66
" Back Pressure 35
" Best Wedge ..... 28—30
" Brass ..... 37—40
" Bronze 95
" Butterfly Brass 41
" " Iron 27
" Check Brass ..... 37—39
" " Iron 23
" Chapman Gate 32
" Chronometer 58
" Climax Gate 27, 28
" " Globe, Angle and Check ..... 23—25
" Coke Oven, Brass 37
" Critchlow 54
" Cross, Brass ..... 37—39
" Fairbanks 33
" Foot 36
" Gate, Brass 40
" " Hydraulic 53
" " Iron ..... 27—33
" Glenn's Hydraulic 53
" Globe, Brass ..... 37—39
" " Hyd 53
" " Iron ..... 23—26
" Handy Gate 40
" Hydraulic 52, 53
" Jenkins, Brass 39
" " Iron 26
" Kennedy " 32
" Lunken Gate 40
" Myers Patent Blow-off 35
" Powell's Star Brass 38
" Pump 86
" Radiator 37
" Regulating 58, 66, 67
" Relief 54

PAGE.

Valves, Safety Brass 40
" " Iron 25
" " Pop 57
" Swinging Check, Brass 38
" " " Iron 25
" Tank 77
" Transfer 27
" Whistle 45
" Y, Brass 40
Vises 77

W

Wall Coils 66
Walworth Stocks 73
Washers 72
Waste Nuts 9
Water Alarms 46
" Filters 60
" Gauge Columns 46
" Gauges 45
" Indicators 46
" Meters 59
" Pipe 1
" Tank Indicators 57
Waters' Governors 57
Watson's Regulating Valves 58
Welded Joints, Electrically 20
Well Barrels 78
Westinghouse Meters 59
Weston's Pulley Blocks 69
Wheels, Trolly 88
" Worm 89
Whistles and Valves 45
Williams' Water Columns 46
" " Indicators 46
Windlass 69
Wire Rope 69
" Wrapped Hose 86
Wooden Tanks 77
Wood Pulleys 71
" Screws 72
" Water Pipe 1
Working Barrels 78
Worm Wheels 89
Wrenches 75, 76
" Cock 41
Wrought Iron Flanges 15
" " Necks 15
" " Nipples and Sockets 8
" " Pipe ..... 1—6

Y

Y's Bowl 21
" Cast Iron 13
" Flanged 17
" Valves, Brass 40

STEEL OR WROUGHT IRON PIPE.

BLACK OR GALVANIZED.

From ⅛ inch to 15 inch diameter inside.

See dimensions, page 3.
See table, page 107.

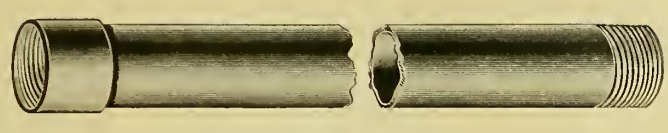


FIG. 1.

SPIRAL WELD PIPE.

From 6 inch to 24 inch diameter.

See table, page 108.

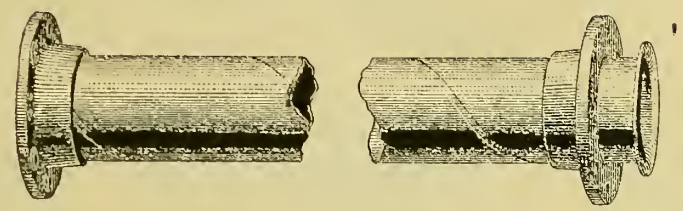


FIG. 2.

SPIRAL RIVETTED PIPE.

BLACK OR GALVANIZED.

From 6 inch to 24 inch diameter.

Plain, Flanged or Bowl ends.

See table, page 108.

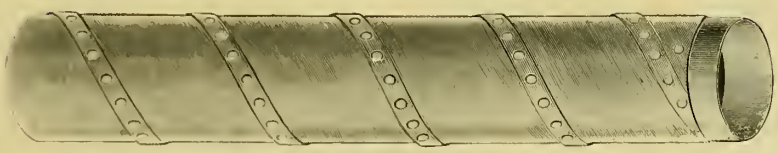


FIG. 3.

CAST IRON BOWL PIPE.

FOR WATER AND GAS.

From 2 in. to 60 in. diameter.

See table, page 109.

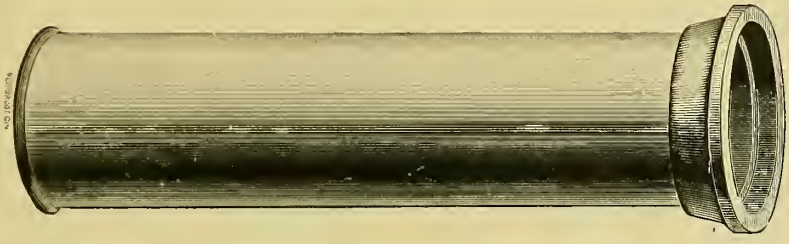


FIG. 4.

CAST IRON FLANGED PIPE.

FOR STEAM AND WATER

From 3 inch to 48 inch diameter.

See table, page 110.

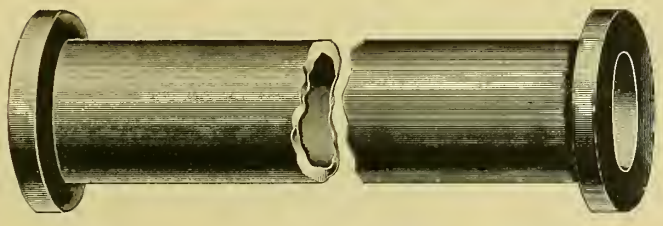


FIG. 5.

LIGHT CAST IRON SOIL PIPE.

From 2 inch to 12 inch diameter.

See table, page 111.

FIG. 6.

WOOD WATER PIPE.

From 1¼ inch to 16 inch diameter.

For Mines, Tanneries, Acid Works, etc.

See table, page 111.

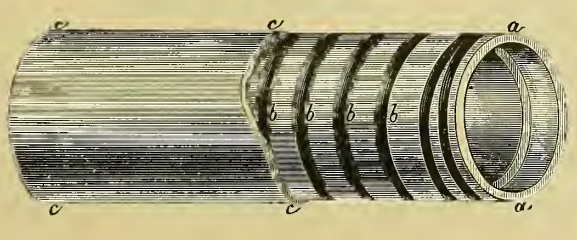


FIG. 7.

Descriptive circular of any of the above pipes on application.

STEEL OR WROUGHT IRON BOILER TUBES OR O. D. PIPE.

From 1 inch to 30 inches diameter.
See dimensions, **page 4.**
See table, **page 112.**

FIG. 8.

LAP WELD CASING.

From 2 inches to 9⅝ inches diameter.
See table, **page 111.**

FIG. 9.

EXTRA HEAVY PIPE.

From ⅛ inches to 8 inches diameter.
See dimensions, **page 5.**
See table, **page 113.**

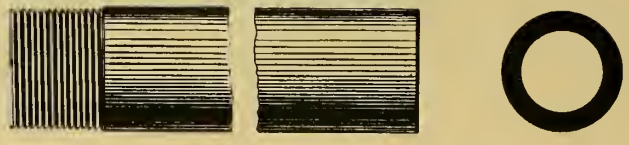


FIG. 10.

DOUBLE EXTRA HEAVY PIPE.

From ⅜ inch to 8 inches diameter.
See dimensions, **page 6.**
See table, **page 113.**

FIG. 11.

RIVETTED PIPE.

HEAVY AND LIGHT.
BLACK OR GALVANIZED.

From 8 inches to 60 inches diameter.
For any pressure.

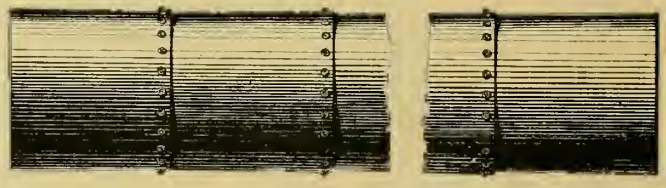


FIG. 12.

SEAMLESS BRASS AND COPPER PIPE.

HEAVY AND LIGHT.

From ⅛ inch to 8 inches diameter.
See table, **page 114.**

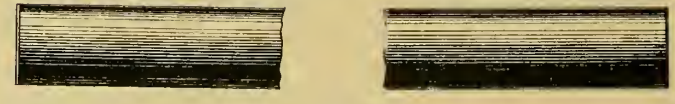


FIG. 13.

LEAD PIPE.

HEAVY AND LIGHT.

From ¼ inch to 2 inches diameter.
See table, **page 114.**

FIG. 14.

STANDARD SIZES STEEL AND WROUGHT IRON PIPE.

Butt Weld 1¼ inch and below. Lap Weld 1½ and above.

See Table, **page 107.**

FIG. 15.

We keep **in stock** all **sizes** to 15 in. inside diameter, and **Cut, Thread, Bend and Fit** any size to order.

No pipe threaded above 15 in. internal or 16 in. external diameter.

STANDARD SIZES O. D. PIPE OR LAP WELD BOILER TUBES.

MADE OF CHARCOAL IRON OR SOFT STEEL.

See Table, page 112.

FIG. 16.

Tubes to 30 in. diameter and of any length, Cut and **Bent** to order.

STANDARD SIZES EXTRA HEAVY PIPE.

See Table, page 113.

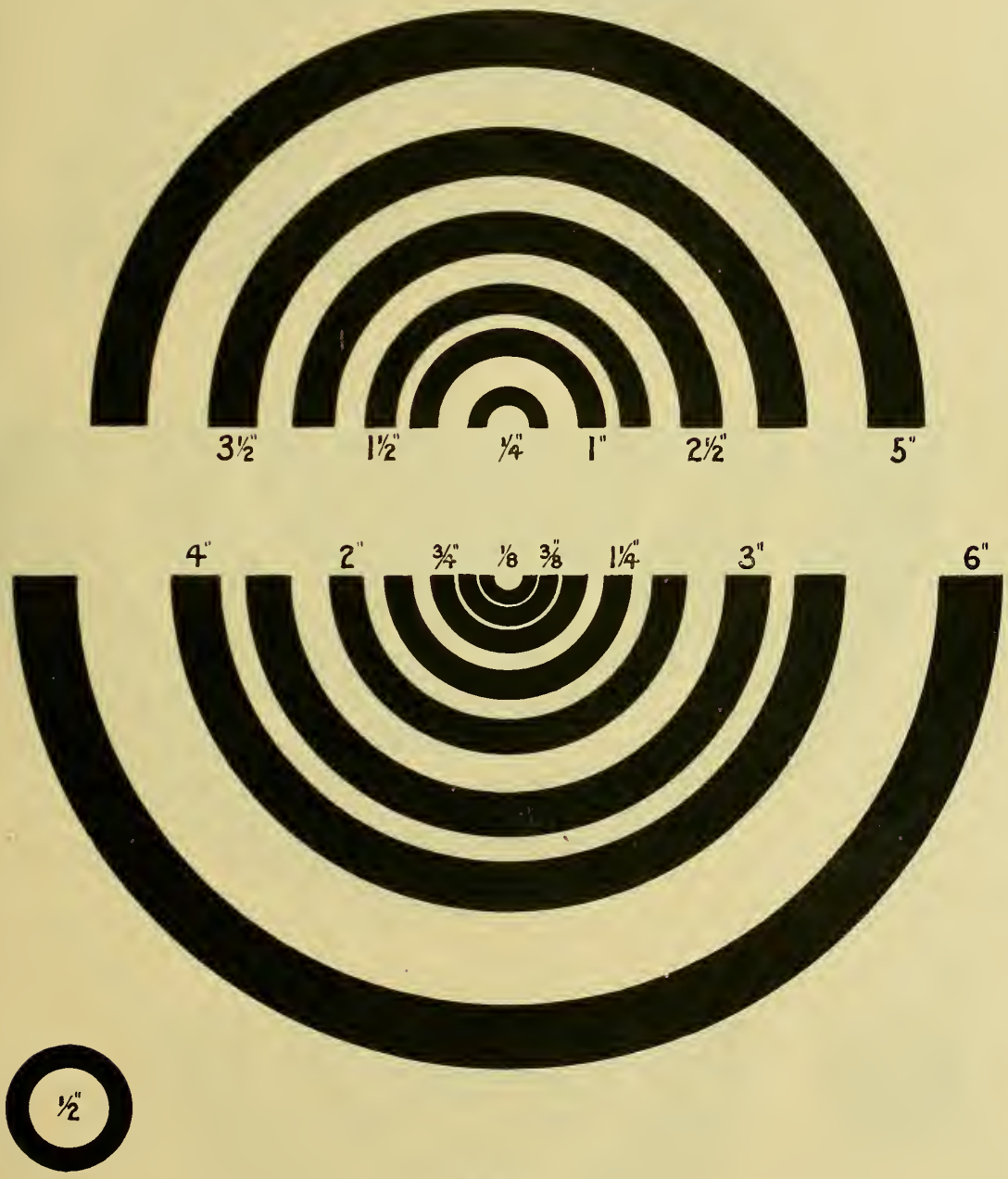


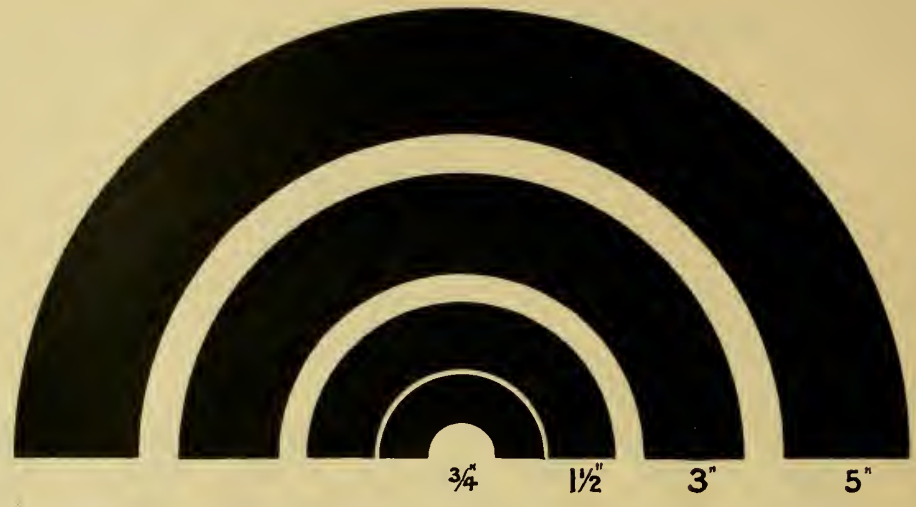
FIG. 17.

All the above **sizes** and to 8 in. kept **in stock,** and Cut, Threaded and Bent to order.

NOTE—External diameters remain the same as standard pipe, and internal diameter is decreased to obtain additional thickness.

STANDARD SIZES DOUBLE EXTRA HEAVY PIPE.

See Table, **page 113.**



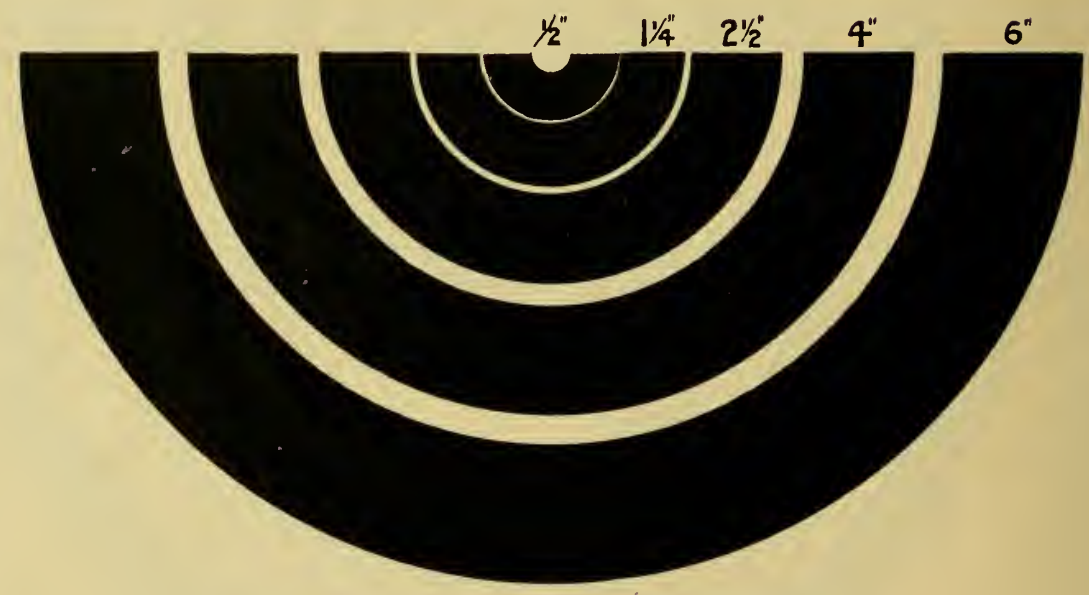


FIG. 19.

PIPE OF SPECIAL THICKNESS TO ORDER.

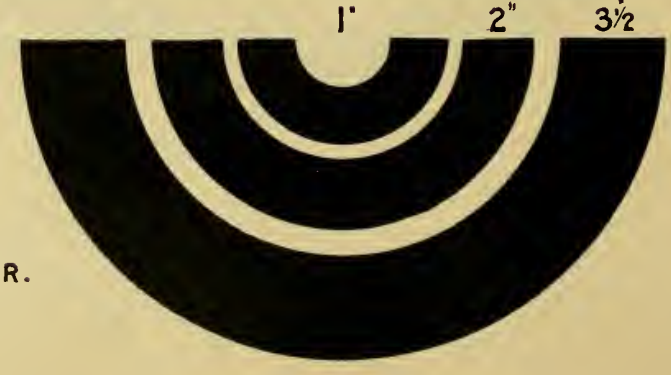


FIG. 18.

Any of the above sizes and to 8 in., Cut, Threaded and Bent to order.

NOTE—External diameters remain the same as standard pipe, internal diameter is decreased to obtain additional thickness.

FIG. 21.

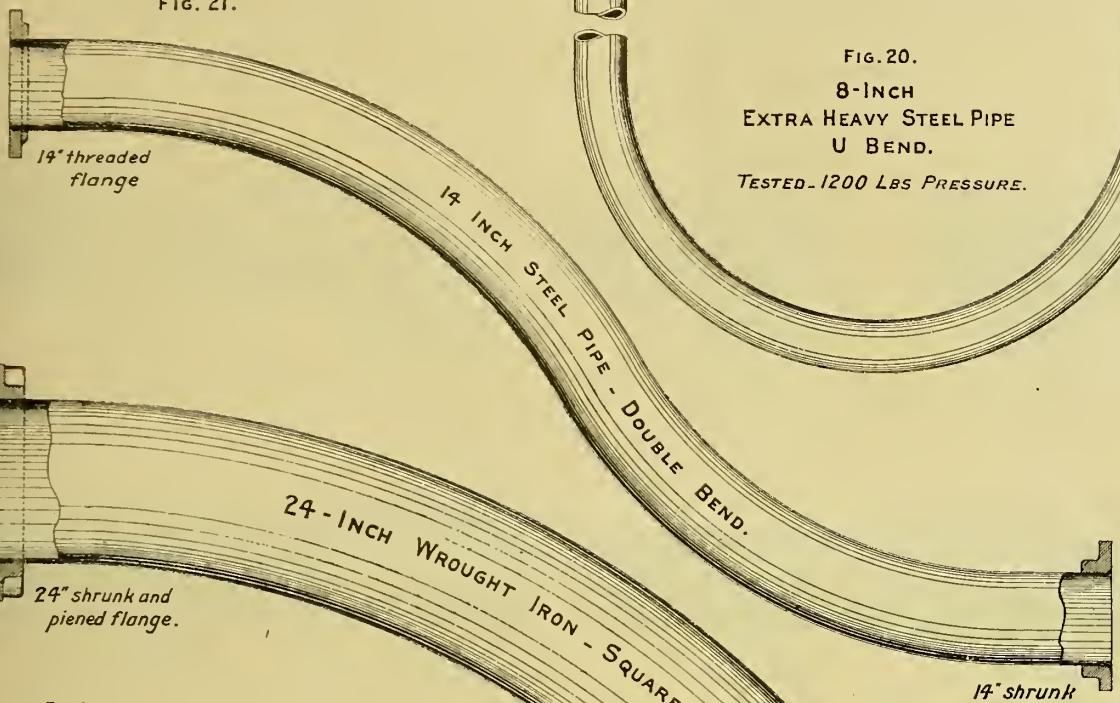
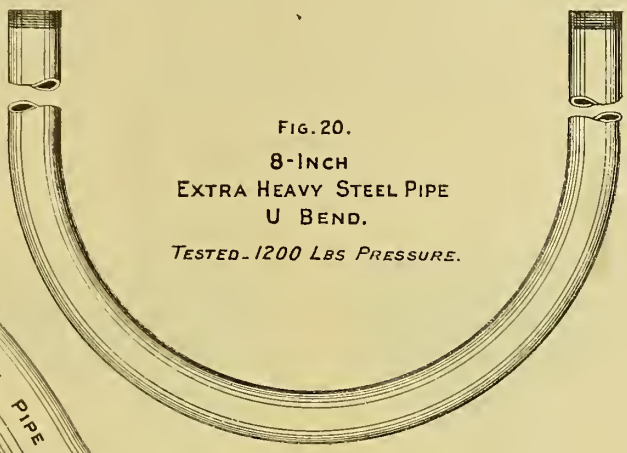


FIG. 20.
8-INCH
EXTRA HEAVY STEEL PIPE
U BEND.
TESTED - 1200 LBS PRESSURE.



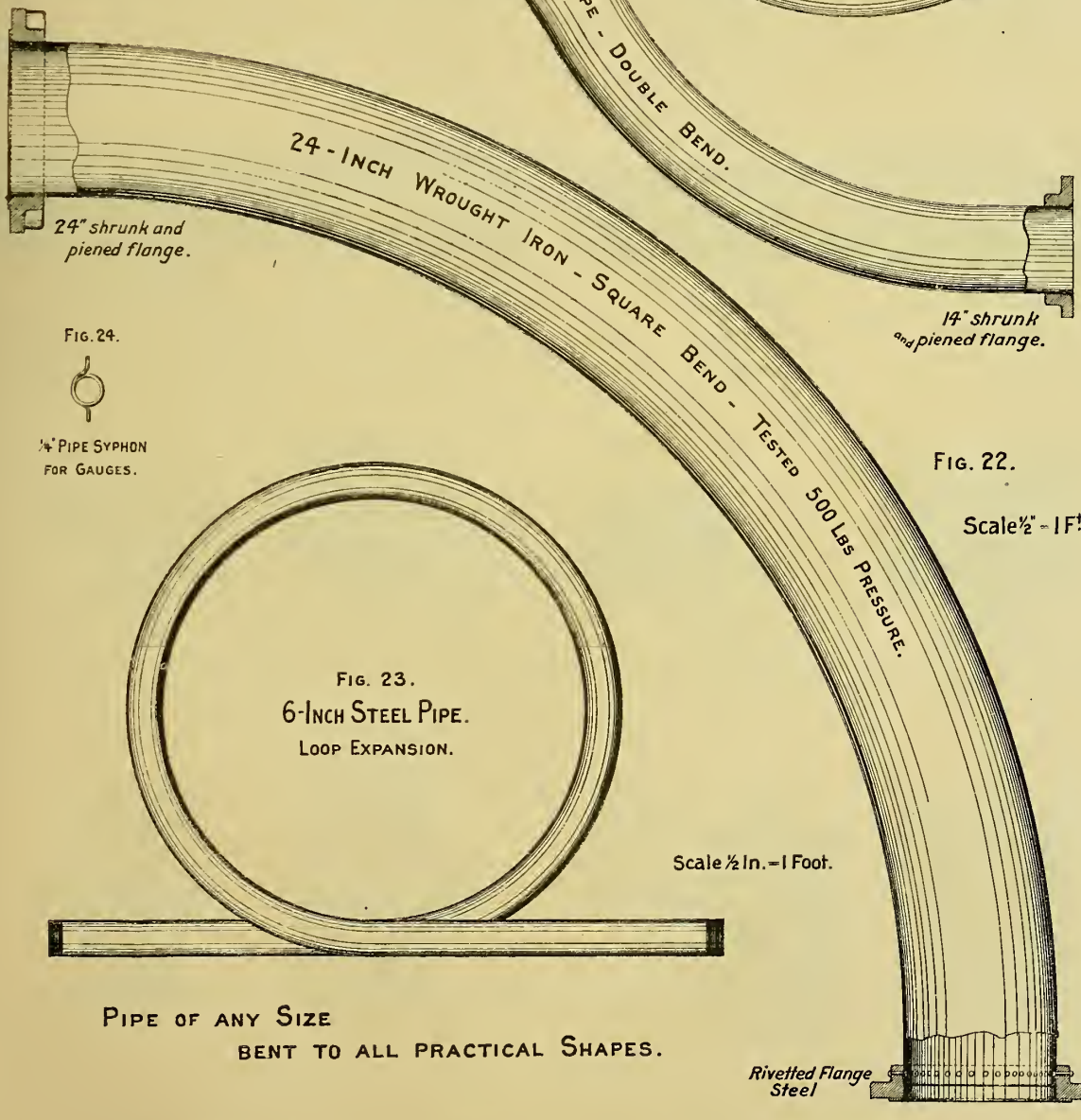


FIG. 24.

¼" PIPE SYPHON FOR GAUGES.

FIG. 22.
Scale ½" - 1 Ft.

FIG. 23.
6-INCH STEEL PIPE.
LOOP EXPANSION.

Scale ½ In. = 1 Foot.

PIPE OF ANY SIZE
BENT TO ALL PRACTICAL SHAPES.

SEE TABLE *PAGE 104* FOR SMALLEST RADIUS.

WROUGHT AND MALLEABLE FITTINGS FOR IRON PIPE.

BLACK OR GALVANIZED, RIGHT OR LEFT HAND THREADS.

FIG. 25.

CLOSE NIPPLE.

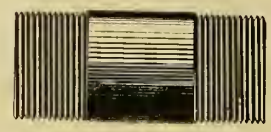


FIG. 26.

SHOULDER NIPPLE.

FIG. 27.

LONG NIPPLE.

FIG. 28.

LONG SCREW NIPPLE.

FIG 29

LONG SCREW, WITH RUNNING SOCKET.

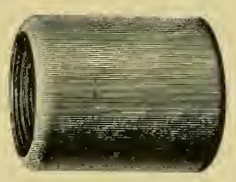


FIG. 30.

SOCKET OR COUPLING.

FIG. 31.

SOCKET, RIGHT AND LEFT.

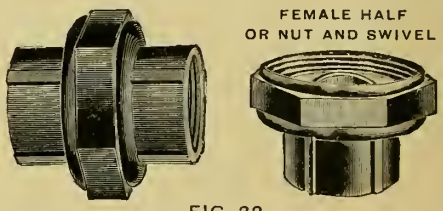
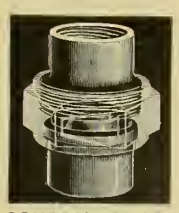


FIG 32.

MALLEABLE UNION.

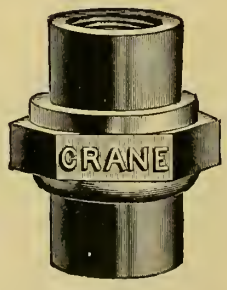


COMPOSITION SEAT.

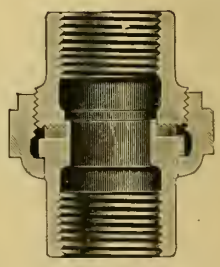
SECTION.

FIG. 33.

KEYSTONE UNION.



COMPOSITION GASKET.



SECTION.

FIG. 34.

CRANE UNION.

MALLEABLE FITTINGS—PLAIN.

BLACK OR GALVANIZED.

FIG 35.
ELBOW.

FIG 36.
TEE.

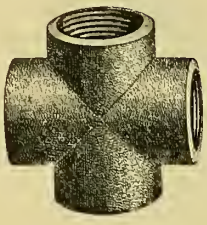


FIG 37.
CROSS.

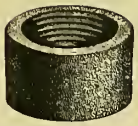


FIG. 38.
CAP.

FIG. 39.
SIDE OUTLET ELBOW.

FIG. 40.
SIDE OUTLET TEE.

FIG. 41.
REDUCER.

FIG. 42.
PLUG.

FIG. 43.
DROP ELBOW.

FIG. 44.
DROP TEE.

FIG. 45.
BUSHING.

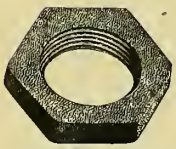


FIG. 46.
LOCKNUT.

FIG. 47.
EXTENSION PIECE.

FIG. 48
WASTE NUT.

FIG. 49.
RETURN BEND.
OPEN.

FIG. 50.
RETURN BEND.
CLOSE.

Full stock of **Reducing Fittings,** also Male and Female Drop Elbows, etc., etc.

MALLEABLE FITTINGS—BEADED.

BLACK OR GALVANIZED.

FIG. 51.
ELBOW.

FIG. 52.
45° ELBOW.

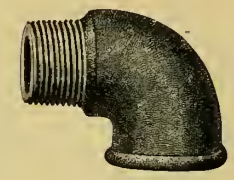


FIG. 53.
STREET ELBOW.

FEMALE.

FIG. 54.
UNION ELBOW.
MALE ELBOWS TO ORDER.

FIG 55
TEE.

FIG. 56.
CROSS.

FIG. 57.
REDUCER.

FEMALE

FIG. 58.
UNION TEE.
MALE TEES TO ORDER.

Full stock of **Heavy Reducing Fittings.**

MALLEABLE RAILING FITTINGS.

SIZES ½ INCH TO 2 INCH INCLUSIVE.

FIG 59.
ELBOW.

FIG 60.
TEE.

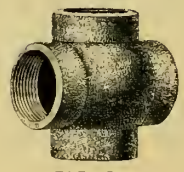


FIG. 61.
CROSS

FIG. 62
ORNAMENT.

FIG. 63.
SIDE OUTLET ELBOW.

FIG. 64.
SIDE OUTLET TEE.

FIG. 65.
SIDE OUTLET CROSS.

FIG. 66.
C. I. RAILING FLANGE.

Brass Railing Fittings to order.

Fittings tapped left hand when so ordered.

Railings cut and fitted complete.

RAILINGS MADE OF IRON OR BRASS PIPE.

PLAIN OR NICKEL PLATED.

Suitable for enclosing Engines, Wheel Pits, Belts, Machinery, Offices, &c.

FIG. 67.

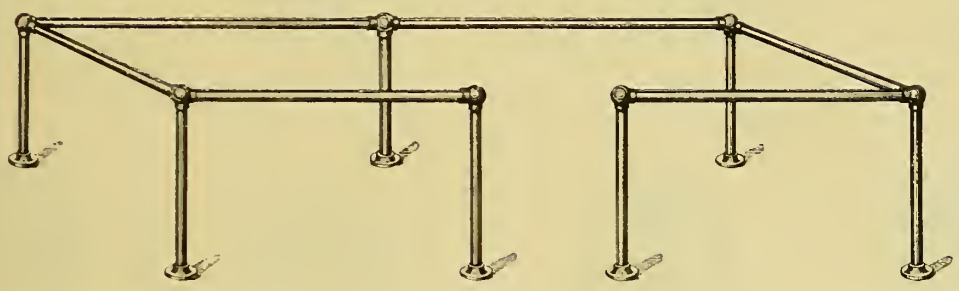


FIG. 68.

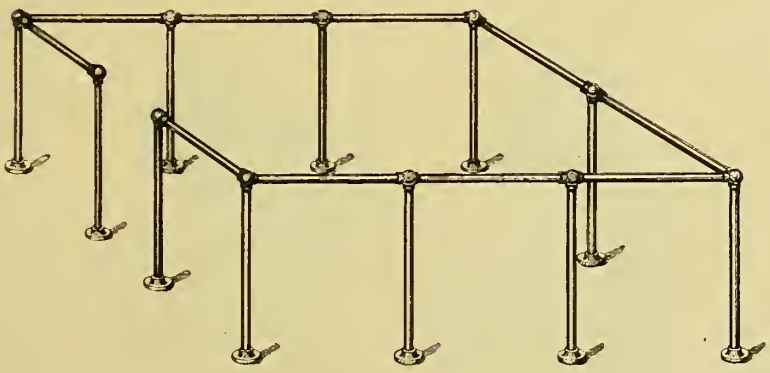
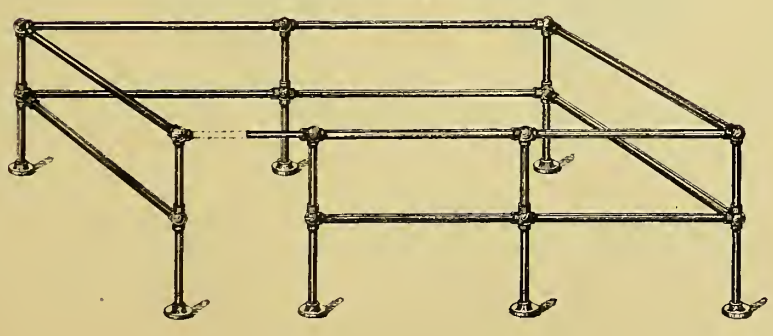


FIG. 69.



CAST IRON FITTINGS.

FIG. 70.
ELBOW.

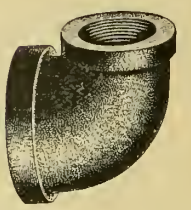


FIG. 71.
REDUCING ELBOW.

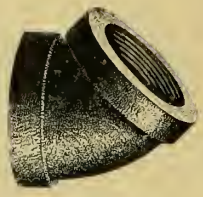


FIG. 72.
45° ELBOW.

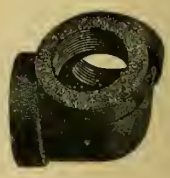


FIG. 73.
SIDE OUTLET ELBOW.

FIG. 74.
TEE.

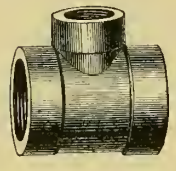


FIG. 75.
TEE REDUCING ON OUTLET.

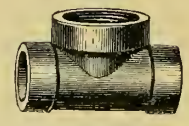


FIG. 76.
TEE REDUCING ON RUN.

FIG. 77.
SIDE OUTLET TEE.

FIG. 78.
TEE REDUCING ON END.

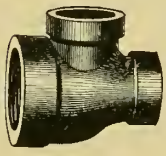


FIG. 79.
TEE REDUCING ON END AND OUTLET.

FIG 80.
CROSS REDUCING ON SIDE OPENINGS.

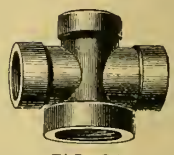


FIG 81
CROSS REDUCING ON END AND SIDE OPENINGS.

FIG. 82.
CROSS.

FIG. 83
RETURN BEND OPEN.

FIG. 84
RETURN BEND CLOSE.

FIG. 85
OPEN RETURN BEND WITH BACK OUTLET.

To read TEES correctly, always take measurements of run first, then outlet: $2 \times 1 \times 1\frac{1}{2}$, reads, $2 \times 1 \times 1\frac{1}{2}$.

For Dimensions see **Table, page 103.**

CAST IRON FITTINGS.

FIG. 86.

Y.

FIG. 87.

REDUCER.

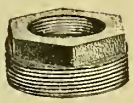


FIG. 88.

BUSHING.

FIG. 89

PLUG.

FIG. 90

OFFSET.

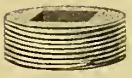


FIG. 91.

CAP.

FIG. 92.

LOCKNUT.

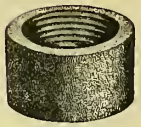


FIG. 93.

PLUG, COUNTERSUNK HEAD.

FIG. 94.

LONG SWEEP ELBOW.

FIG. 95.

LONG SWEEP DOUBLE ELBOW.

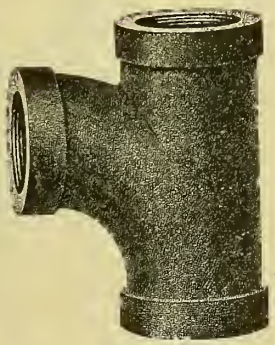


FIG. 96.

LONG SWEEP TEE.

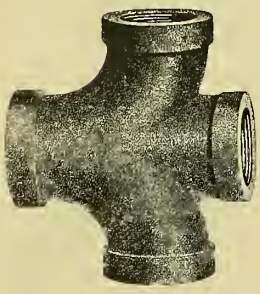


FIG. 97.

LONG SWEEP CROSS.

Long Sweep Elbows and Tees with Base, to order.

For Dimensions, See **Table, page 103.**

CAST IRON FITTINGS.

BRANCH TEES OR MANIFOLDS.

FIG. 98.
PLAIN.

FIG. 99.
WITH BACK INLET ON END.

FIG. 100.
WITH BACK INLET IN CENTER.

HOOK PLATES.

FIG. 101.
COIL STAND.

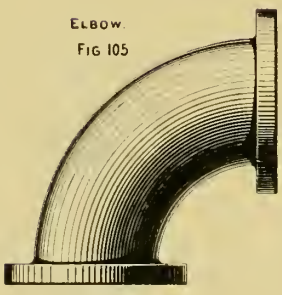
FIG 102
PLAIN.

FIG. 103.
EXPANSION.

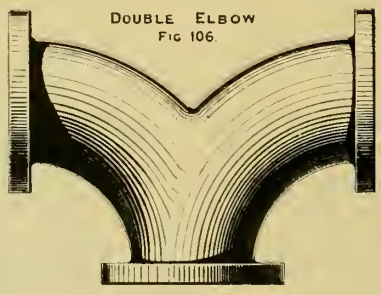
FIG 104.
PLAIN SINGLE

For dimensions see Table, **page 103.**

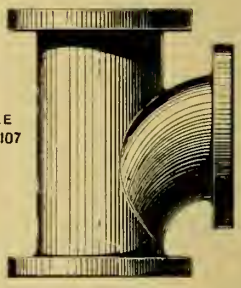
LONG RADIUS FLANGED FITTINGS TO ORDER.



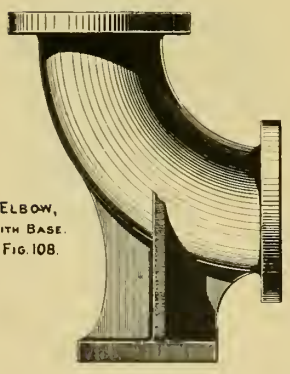
ELBOW.
FIG 105



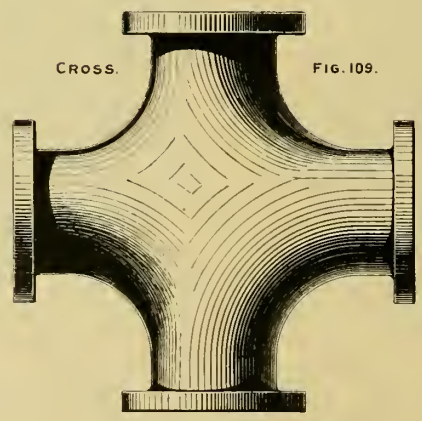
DOUBLE ELBOW
FIG 106.



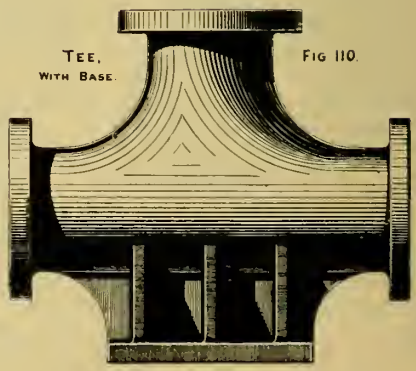
TEE
FIG 107



ELBOW,
WITH BASE.
FIG. 108.



CROSS. FIG. 109.



TEE,
WITH BASE. FIG 110.

For dimensions see **Table, page 104.**

FLANGES.

MADE OF CAST IRON, CAST STEEL. TO 30 IN. INTERNAL DIAMETER. MADE OF WROUGHT IRON, ROLLED STEEL, OR BRASS.

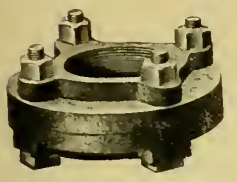


FIG 111.
FLANGED UNION.

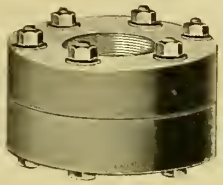


FIG. 112.
HYDRAULIC FLANGED UNION.

FIG 113.
RAISED HOLE FLANGE.

FIG. 114.
PLAIN FLANGE.

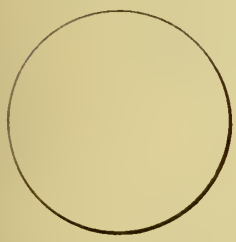


FIG. 115.
BLIND FLANGE.

FIG. 116.
CURVED FLANGE.

FIG. 117.
ECCENTRIC FLANGE.
FOR FULL DRAINING.

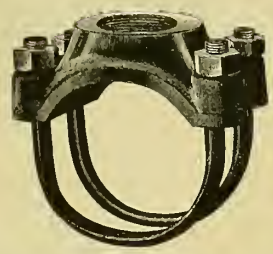


FIG. 118
SADDLE.
STEEL, MALLEABLE OR CAST IRON, DOUBLE OR SINGLE STRAP.

FIG 119
FLANGES.
MALE AND FEMALE

FIG 120
HEAVY FLANGE.
SHRUNK AND BEADED (for Steam.)

FIG 121
LIGHT FLANGE.
SHRUNK AND BEADED (for Exhaust.)

FIG 122
COPPER PIPE FLANGE.

FIG 123
STEEL OR WROT. FLANGE.
FOR RIVETTING

FIG 124
CAST IRON OR CAST STEEL FLANGE.
FOR RIVETTING

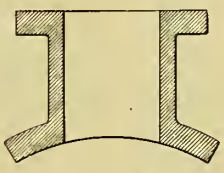


FIG 125
CAST IRON OR CAST STEEL NECK.

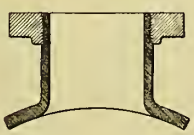
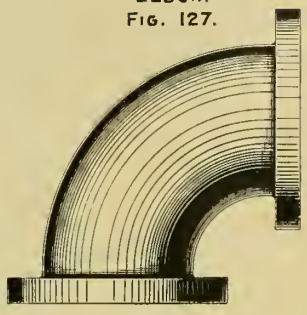


FIG 126
STEEL OR WROT. NECK,
WITH SCREWED FLANGE.

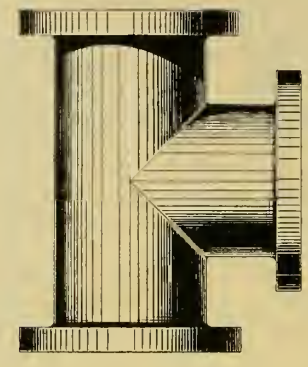
For Sizes and Dimensions see **Table, pages 100 and 101.**

FLANGED FITTINGS.

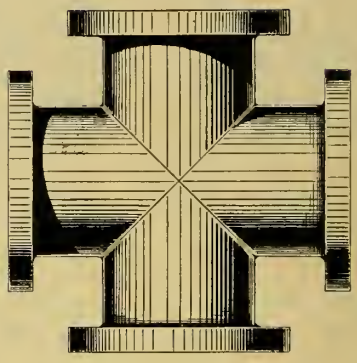
ELBOW.
FIG. 127.



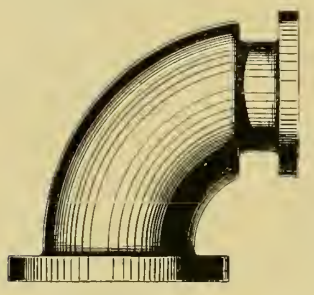
TEE.
FIG. 128.



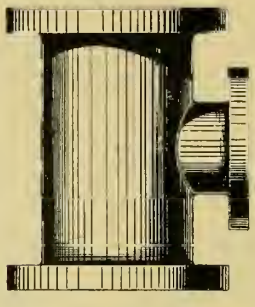
CROSS.
FIG. 129.



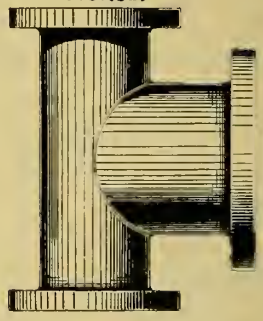
REDUCING ELBOW.
FIG. 130.



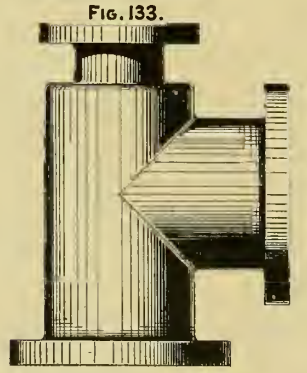
TEE.
REDUCING ON OUTLET.
FIG. 131.



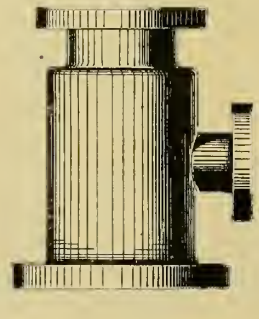
TEE.
REDUCING ON RUN.
FIG. 132.



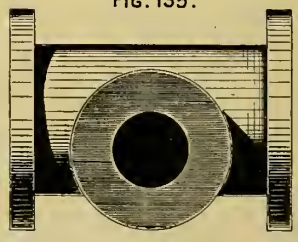
TEE.
REDUCING ON END.
FIG. 133.



TEE.
REDUCING ON END AND OUTLET.
FIG. 134.



ECCENTRIC TEE.
FOR DRAINING STEAM LINES.
FIG. 135.

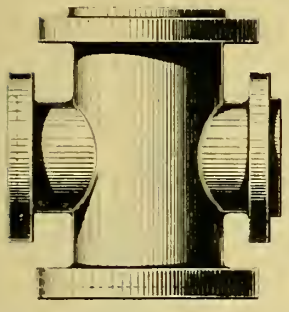


Side Outlets on any of above and Recessed Joints to order.

For sizes and dimensions see **Table, pages 102 and 105.**

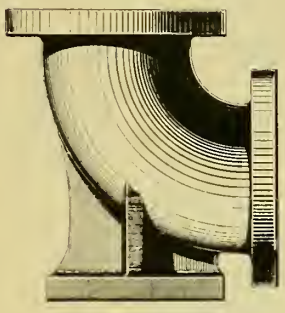
FLANGED FITTINGS.

CROSS,
REDUCING ON OUTLETS
MALE AND FEMALE JOINTS.
FIG. 136.

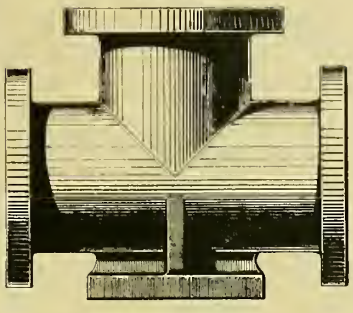


RECESSED JOINTS ON ALL FLANGED FITTINGS AND FLANGES WHEN SO ORDERED

ELBOW,
WITH BASE.
FIG. 137.

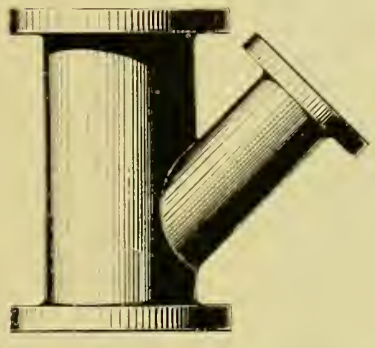


TEE,
WITH BASE.
FIG. 138.

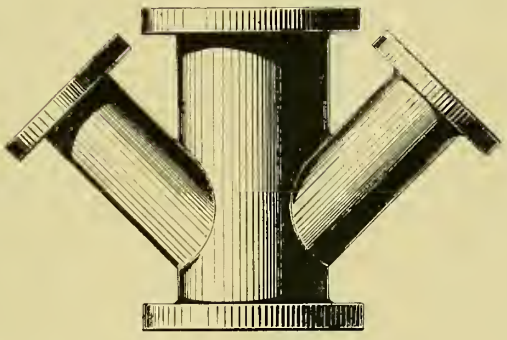


45° ELBOW.
FIG. 139.

Y,
WITH REDUCING BRANCH.
FIG. 140.

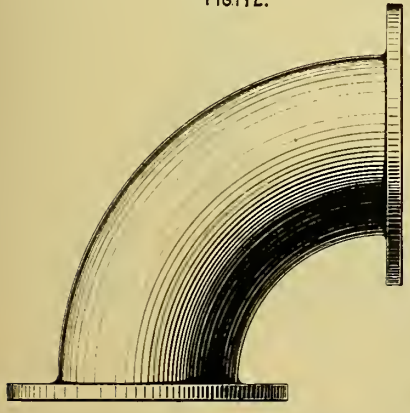


DOUBLE Y,
WITH REDUCING BRANCHES.
FIG. 141.

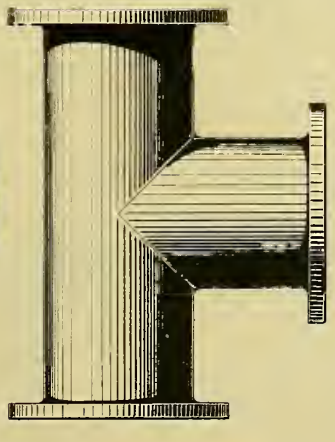


LIGHT FLANGED FITTINGS FOR EXHAUST.

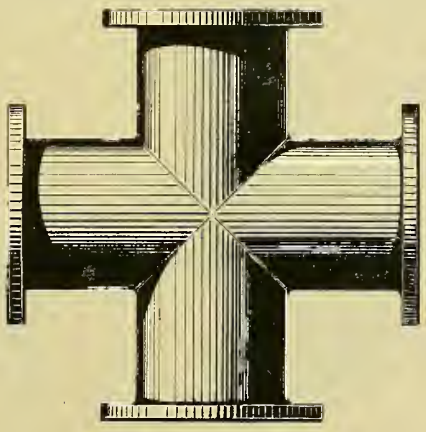
ELBOW.
FIG. 142.



TEE.
FIG. 143.



CROSS.
FIG. 144.

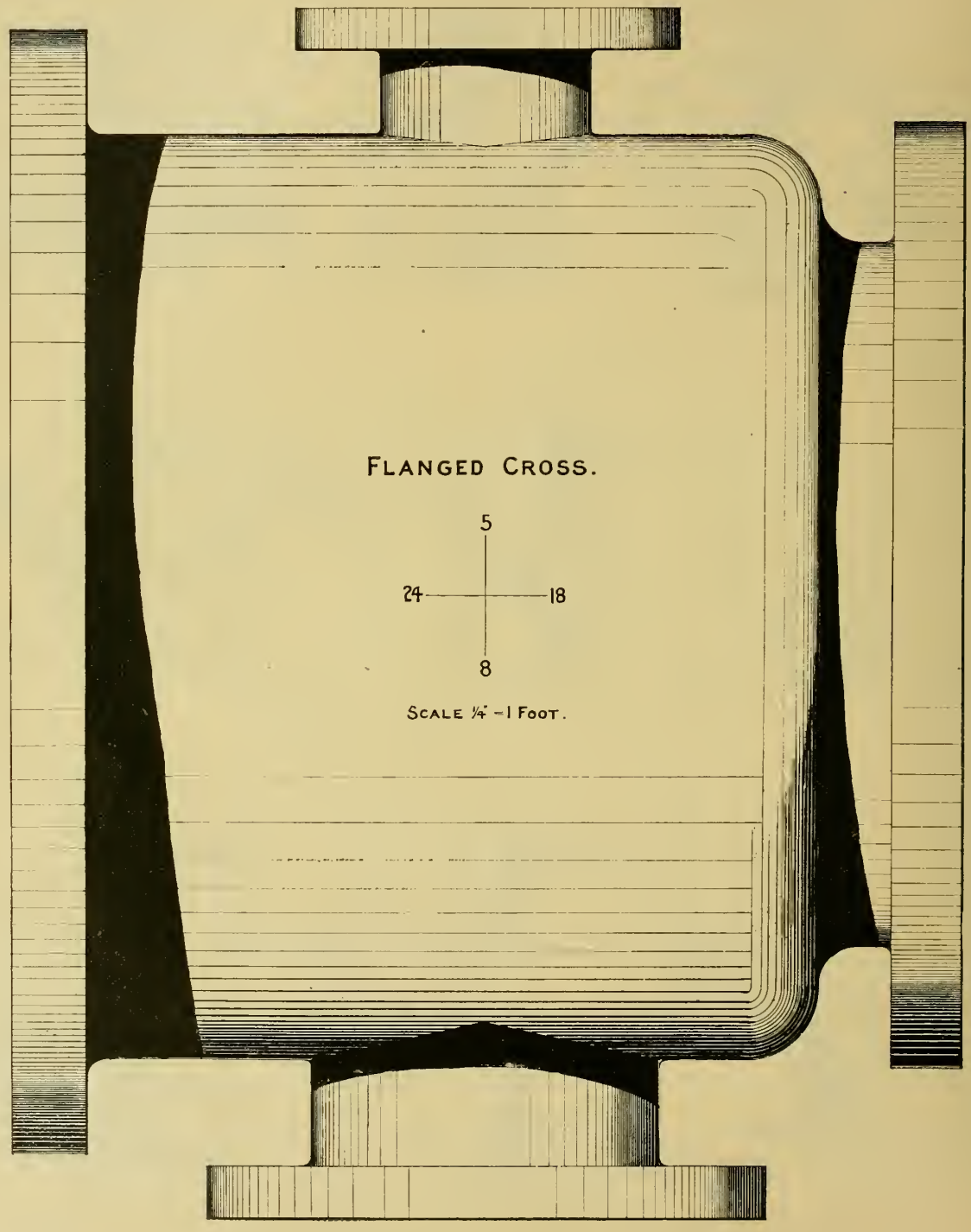


LIGHT REDUCING FITTINGS TO ORDER.

Side Outlets on any of above and Recessed Joints to order.

For sizes and dimensions see Table **pages 102 and 105.**

FIG. 145.



SPECIAL FITTINGS OF ANY SIZE TO ORDER.

FULL SIZE SECTION OF

HEAVY CAST IRON STEAM PIPE FLANGE,

For 16 Inch Outside Diameter Threaded Pipe.

Guaranteed Tight at 300 Lbs. Pressure.

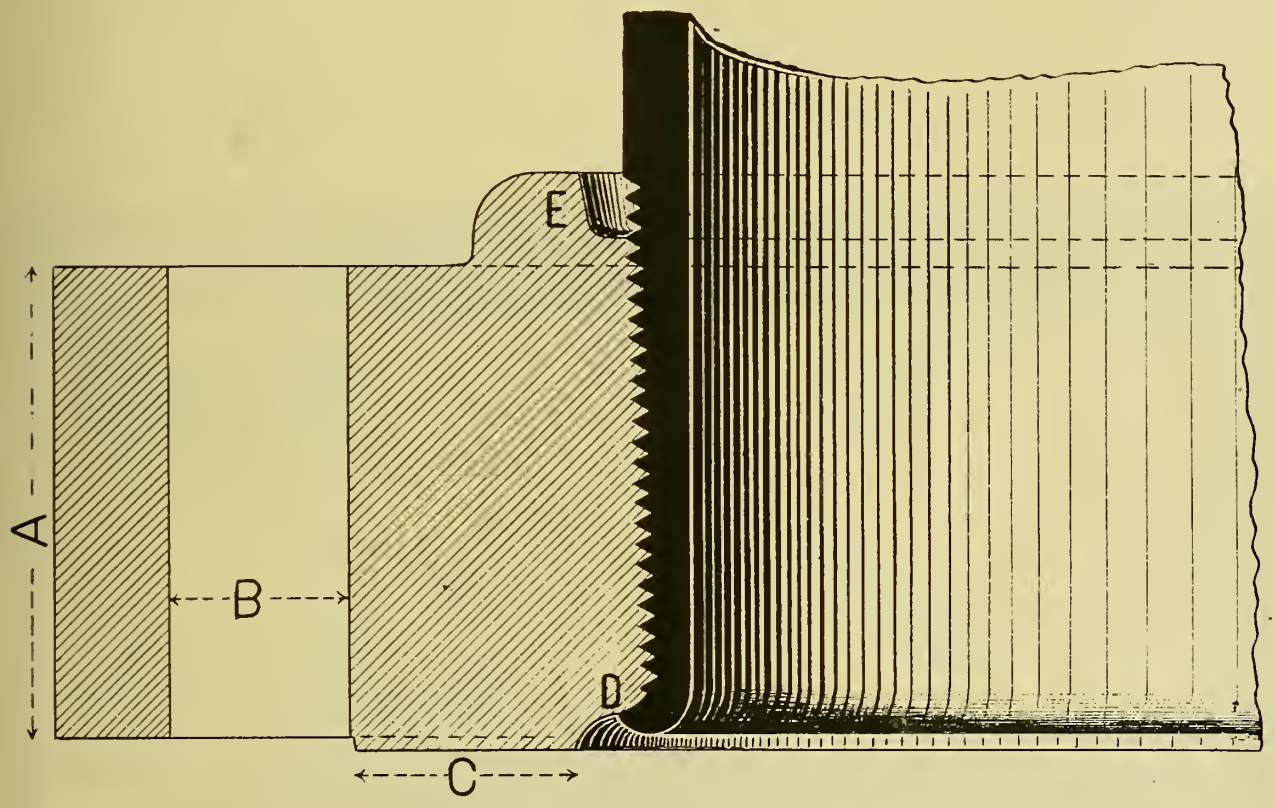


FIG. 146.

NOTE THE SPECIAL ADVANTAGES OF THIS FLANGE:

A—Thickness, giving strength and depth of thread.

B—Large size and number of bolts. (See table pages 100 and 101.)

C—Projection to receive gasket inside of bolt holes. This allows a greater pressure to bear on same than if gasket was distributed over entire face of flange.

D—End of pipe turned and pieced into groove on face of flange and then caulked. The flange is made tight by this means **entirely independent** of thread.

E—Groove or pocket on back of flange to receive copper strip for caulking if ever required.

All size Steam Flanges are made in same proportion to the above of CAST IRON or STEEL, WROUGHT IRON or ROLLED STEEL.

THE PERFECT JOINT

ROLLED STEEL FLANGE AND STEEL PIPE.

Welded Together by ELECTRICITY.

No Threads, No Piening.
No Rivets, No Caulking,
No Leaking.

GUARANTEED ABSOLUTELY TIGHT AT

500 lbs. Pressure using Standard Pipe.
1000 " " " Ex. Heavy "
2000 " " " Dbl. Ex. " "

TIGHT AS LONG AS THE PIPE LASTS.

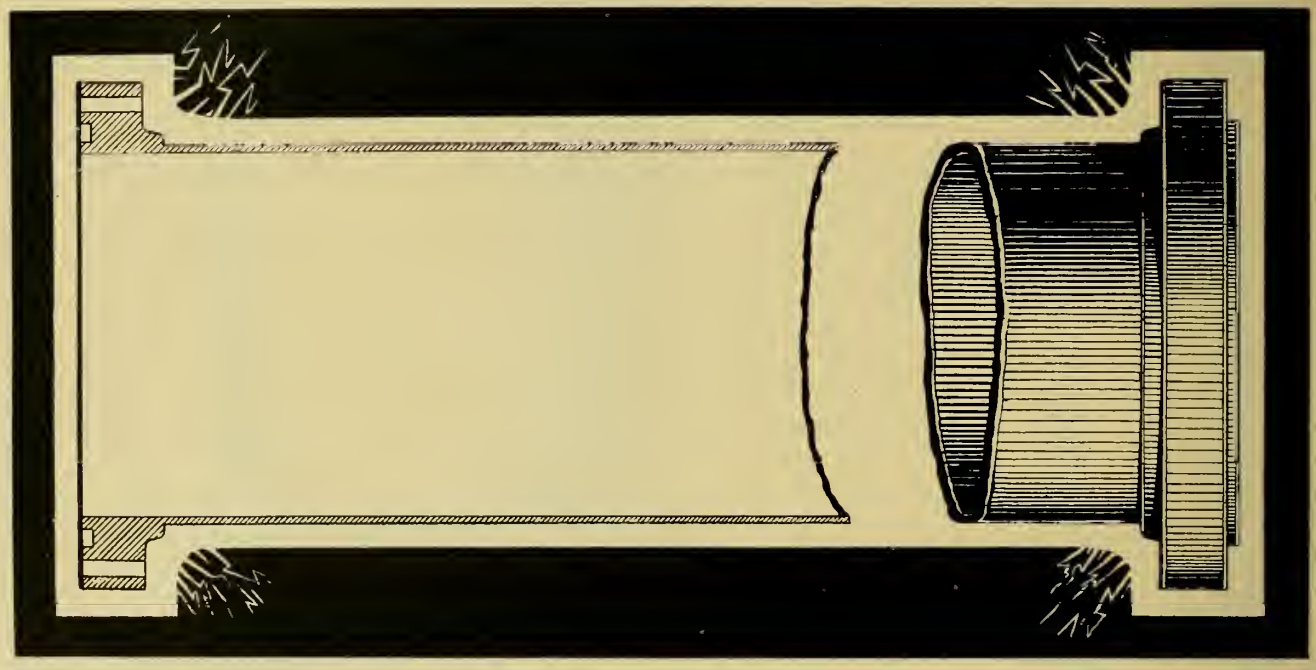


FIG. 147.

Engineers, Superintendents and Managers of High Pressure Steam Plants for Traction and Electric Light Purposes, Steel Mills, Blast Furnaces, Water Works, Paper and Pulp Mills, Sugar Refineries, Steamships, etc., have always felt the need of a **better method** of connecting large steam and hydraulic pipes and flanges together than threading, riveting or piening. This **difficulty is overcome** by welding these pieces together, thereby securing a joint that can be **depended upon absolutely.**

Rolled Steel Flanges Welded to Pipe of any size from 1 to 24 inches Diameter.

BOWL FITTINGS FOR CAST IRON PIPE.

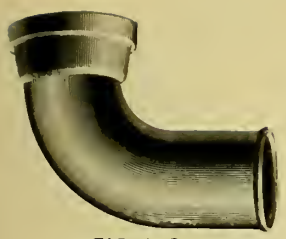


FIG. 148.
ELBOW 90°.

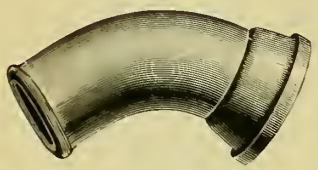


FIG. 149.
ELBOW 45°

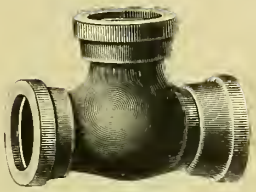


FIG 150
TEE.
BOWL ALL ENDS.

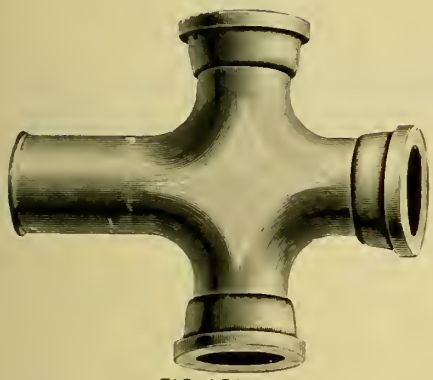


FIG. 151.
CROSS.

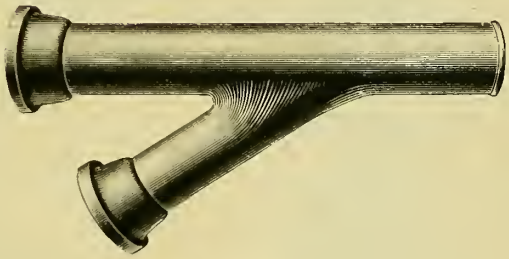


FIG. 152.
Y.

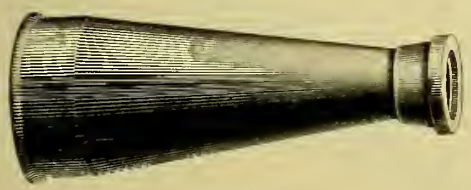


FIG. 153.
REDUCER.

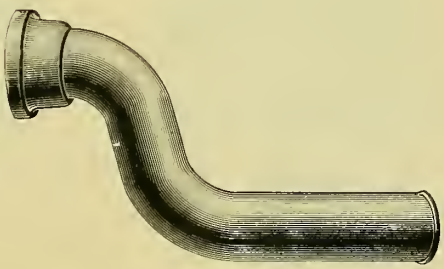


FIG. 152.
OFFSET OR S.

FIG. 155.
SLEEVE.

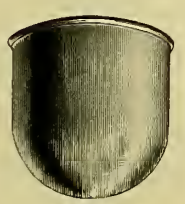


FIG. 156
PLUG.

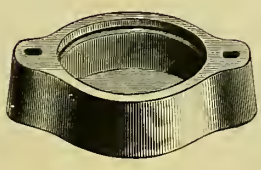


FIG. 157.
CAP.

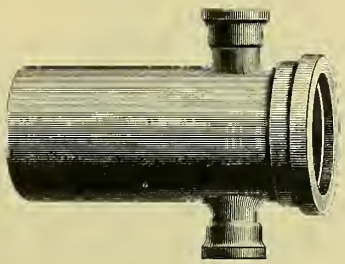


FIG. 158.
DRIP BOX.

For Sizes and Weights, see Table, **page 106.**

AMMONIA FITTINGS, VALVES, ETC.

FIG. 159.
ELBOW.

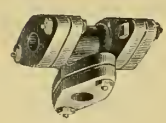


FIG. 160.
TEE.

FIG. 161.
CROSS.

FIG. 162.
COUPLINGS.

FIG. 163.
RETURN BENDS.

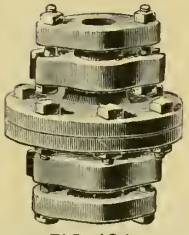


FIG. 164.
FLANGED UNIONS.

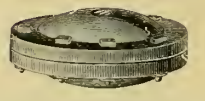


FIG. 165.
STRAINERS.

FIG 166
BRANCH TEE HEADER.

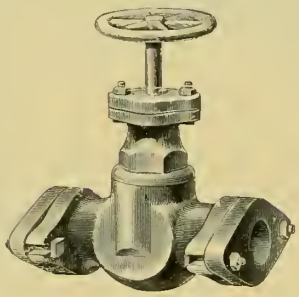


FIG. 167.
GLOBE AND ANGLE VALVES.

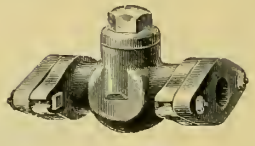


FIG. 168.
CHECK VALVES.

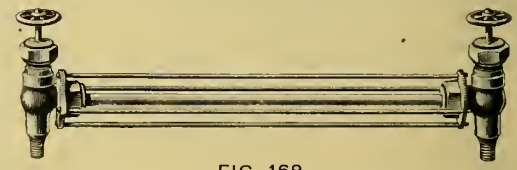


FIG 169.
AUTOMATIC GAUGE.

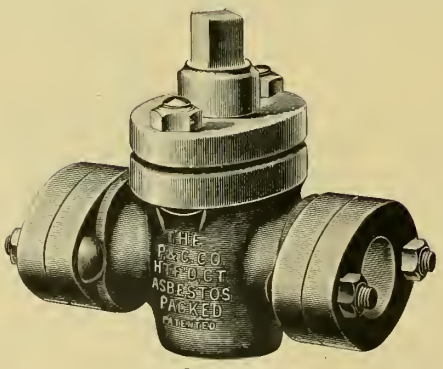


FIG. 170.
AMMONIA COCK.
ASBESTOS PACKED.

FIG. 171
AMMONIA GAUGE.

IRON BODY.

ANGLE VALVES.

BRASS MOUNTED.

FIG. 172.
SCREWED.
FINISHED BRASS TOP

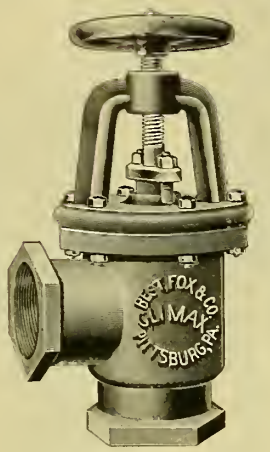


FIG. 173.
CLIMAX HEAVY.
ARCH TOP SCREWED

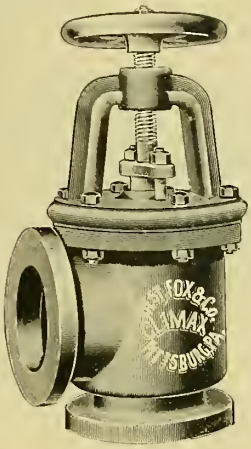


FIG. 174.
CLIMAX HEAVY.
ARCH TOP FLANGED

GLOBE VALVES.

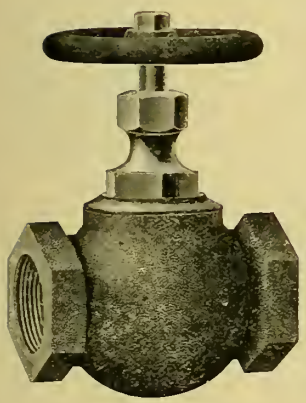


FIG. 175.
SCREWED.
FINISHED BRASS TOP

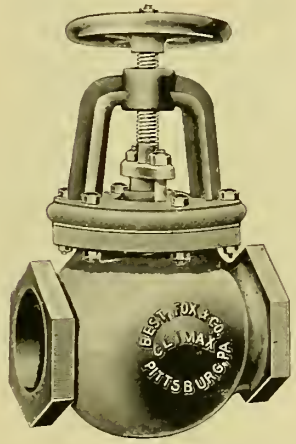


FIG. 176.
CLIMAX HEAVY.
ARCH TOP SCREWED

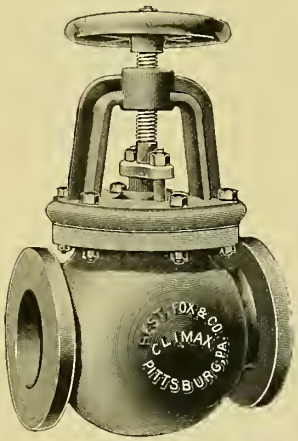


FIG. 177.
CLIMAX HEAVY.
ARCH TOP FLANGED

CHECK VALVES.

FIG. 178.
GLOBE SCREWED

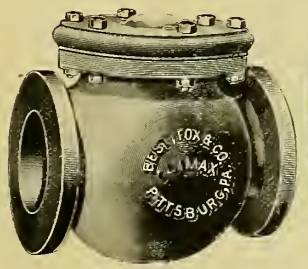


FIG. 179.
CLIMAX HEAVY, GLOBE FLANGED.

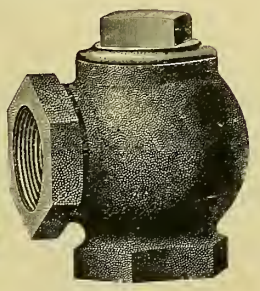


FIG. 180.
ANGLE SCREWED.

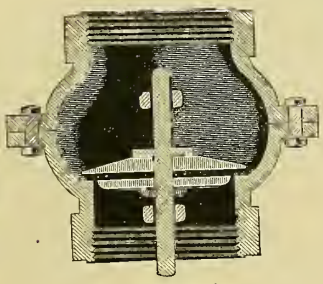
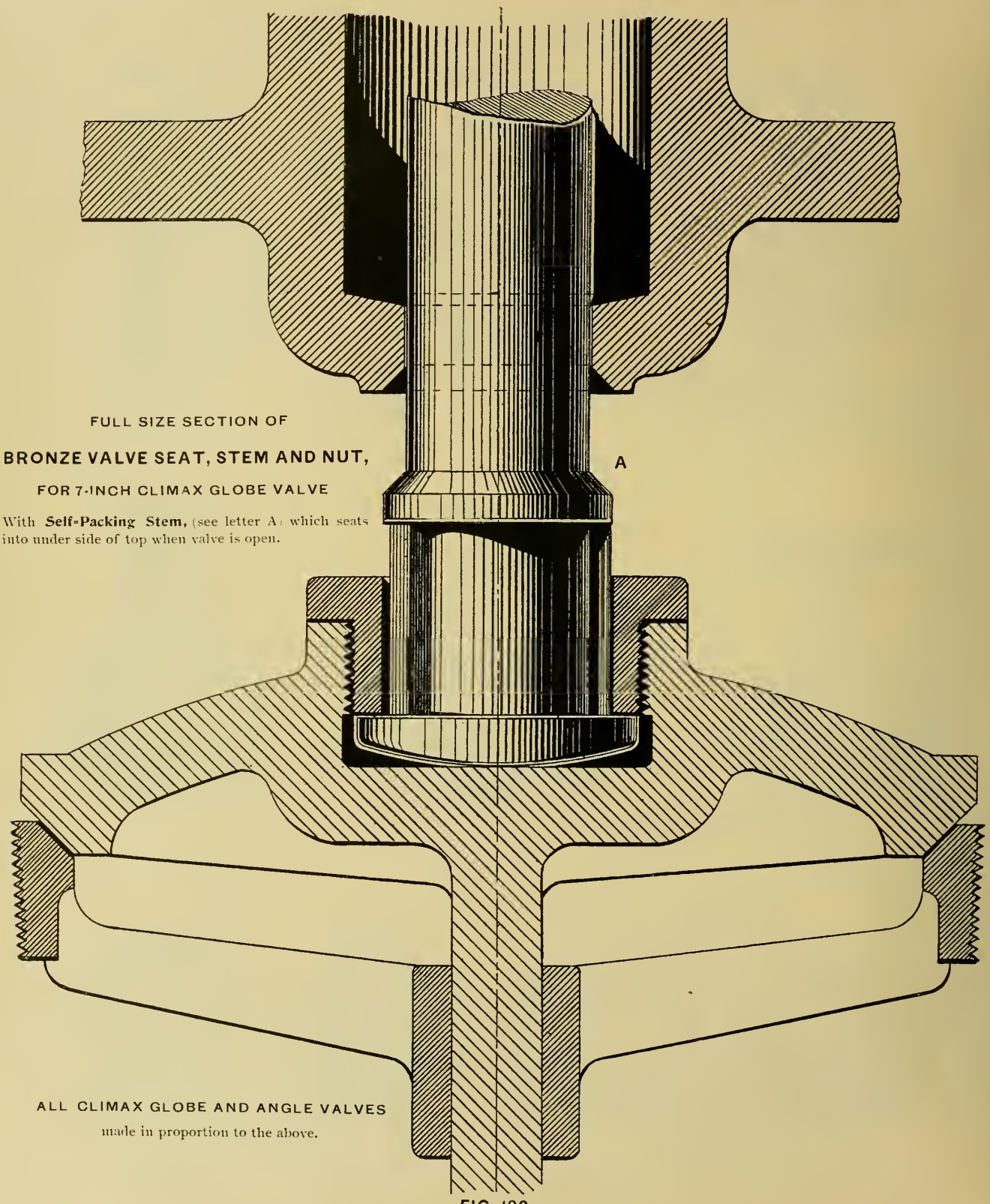


FIG. 181.
VERTICAL SCREWED.
(IN SECTION.)

For Sizes and Dimensions see Table **pages 102 and 103.**



FULL SIZE SECTION OF

BRONZE VALVE SEAT, STEM AND NUT,

FOR 7-INCH CLIMAX GLOBE VALVE

With **Self-Packing Stem,** (see letter A) which seats into under side of top when valve is open.

ALL CLIMAX GLOBE AND ANGLE VALVES

made in proportion to the above.

FIG. 182.

IRON BODY. **SAFETY VALVES.** BRASS MOUNTED.

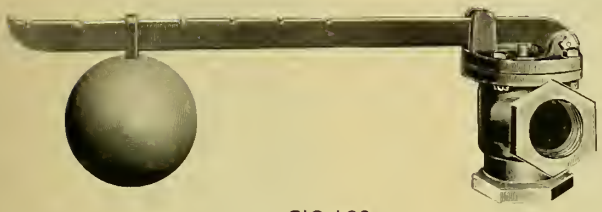


FIG 183.
CLIMAX.
ANGLE SCREWED.

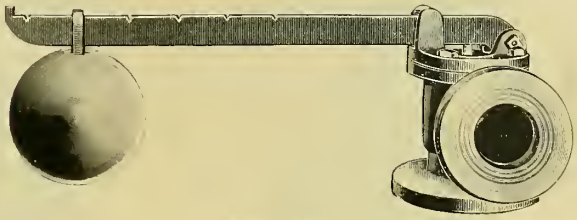


FIG 184.
CLIMAX.
ANGLE FLANGED.

Three Way Climax Safety Valves to order.

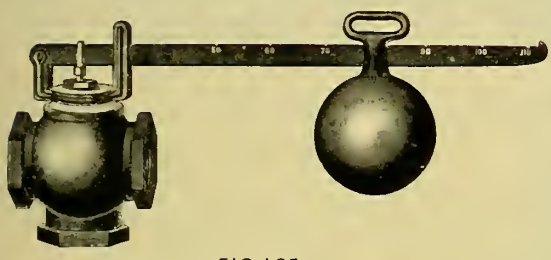


FIG 185.
STANDARD.
THREE WAY SCREWED.

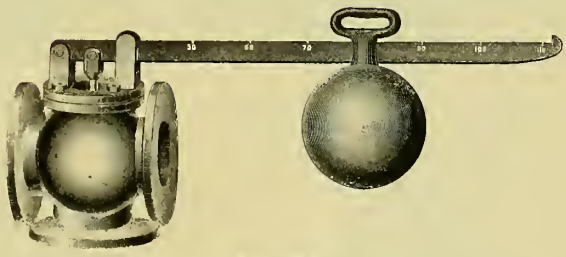


FIG 186.
STANDARD.
THREE WAY FLANGED.

Steam to Engines, etc , can be taken from these Safety Valves.

SWINGING CHECK VALVES.

VALVES IN SAME ALL BRASS OR LEATHER FACE.

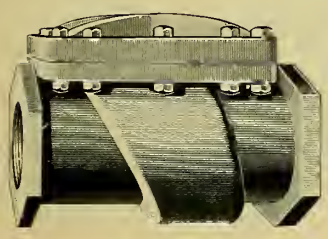


FIG 187.
SCREWED

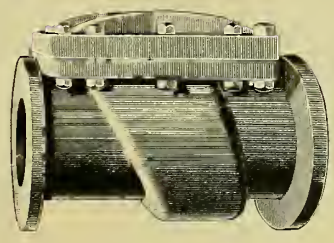


FIG 188.
FLANGED.

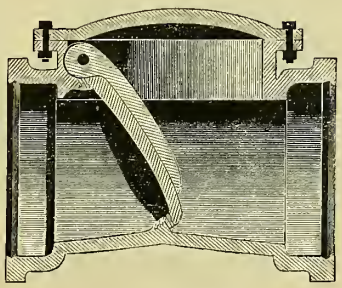


FIG 189.
BOWL OR HUB ENDS.
(IN SECTION.)

For Sizes and Dimensions see Table pages **102 and 103.**

IRON BODY. **JENKINS STEAM VALVES.** BRASS MOUNTED.

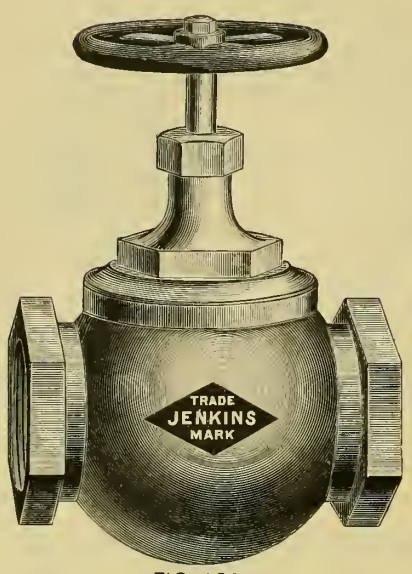


FIG. 190.
GLOBE VALVE SCREWED.
BRASS TOP FINISHED.

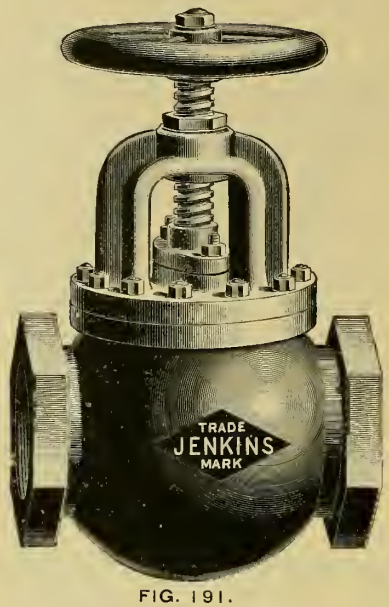


FIG. 191.
GLOBE VALVE SCREWED.
ARCH TOP.

FIG. 192.
GLOBE VALVE FLANGED.
ARCH TOP.

IRON BODY. **ASBESTOS STEAM VALVES.** BRASS MOUNTED.

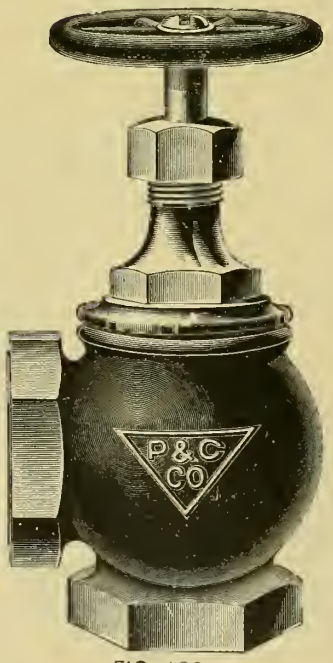


FIG. 193.
ANGLE SCREWED.
BRASS TOP FINISHED.

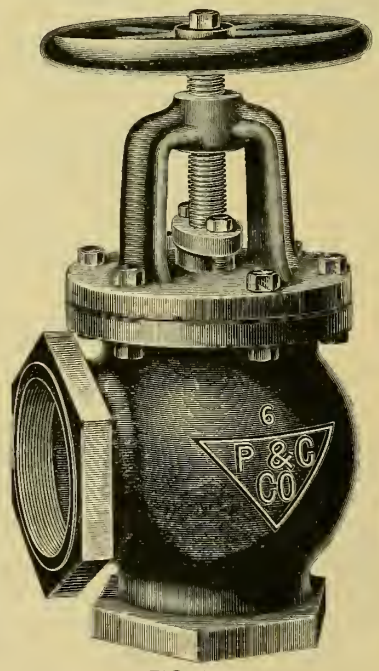


FIG. 194.
ANGLE SCREWED.
ARCH TOP.

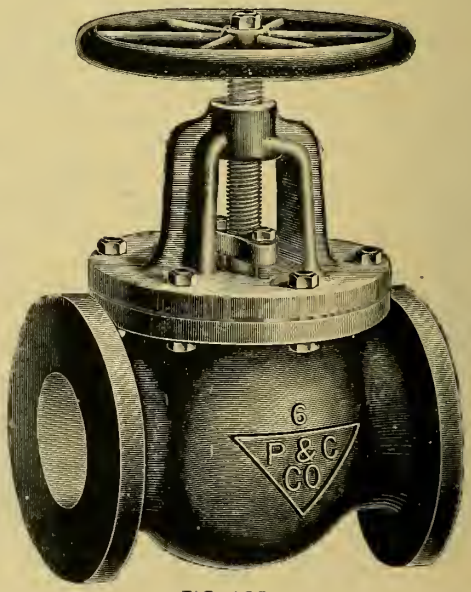


FIG. 195.
FLANGED.
ARCH TOP.

Discs or Rings for Renewing Jenkins and Asbestos Valves of all sizes in stock.

IRON BODY.

CLIMAX GATE VALVES.

HEAVY FOR STEAM, WATER AND GAS.

BRASS MOUNTED OR ALL IRON.

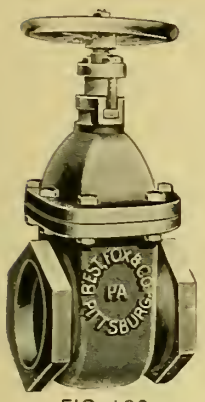


FIG. 196.
SCREWED.

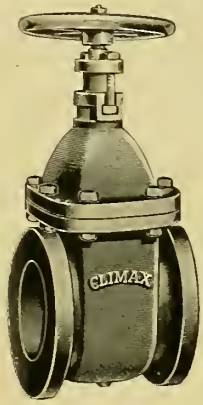


FIG. 197.
FLANGED.

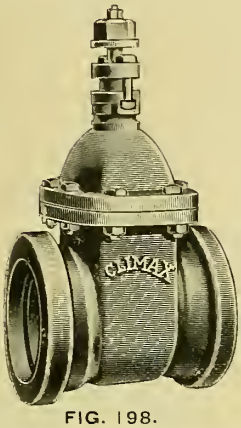


FIG. 198.
BOWL OR HUB ENDS.

LIGHT GATE VALVES.

FOR EXHAUST.

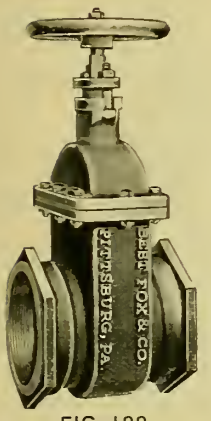


FIG. 199.
SCREWED.

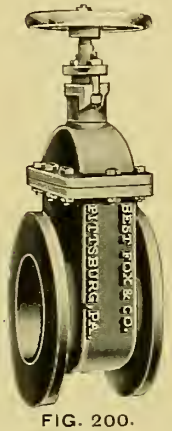


FIG. 200.
FLANGED.

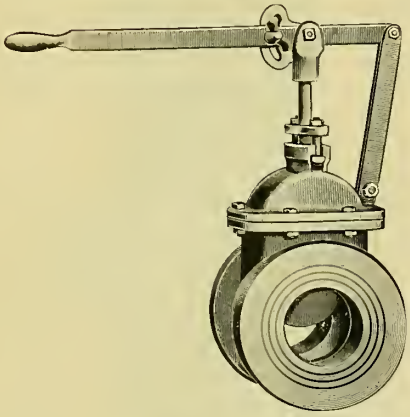


FIG. 201.
SCREWED OR FLANGED.
QUICK OPENING.

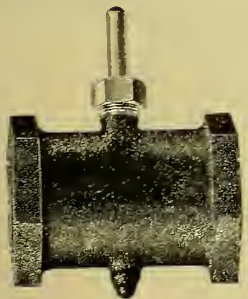


FIG. 202.
BUTTERFLY VALVE.
SCREWED OR FLANGED.

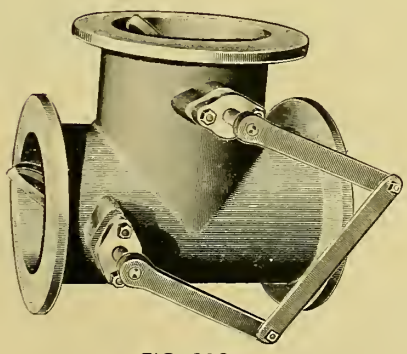


FIG. 203.
DOUBLE BUTTERFLY VALVE.
FLANGED.

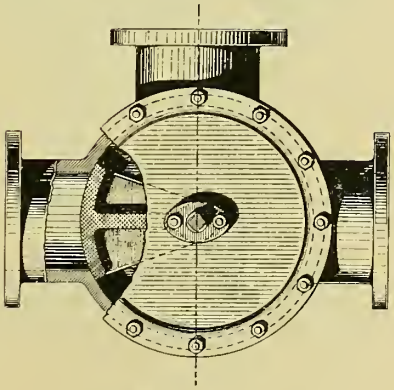


FIG. 204.
TRANSFER VALVE.
FLANGED

For Sizes and Dimensions see Table, **pages 102, 103 and 104.**

SECTIONS OF

DOUBLE DISC GATE VALVES

WITH

REMOVABLE BRONZE SEATS.

Heavy—Guaranteed tight at 200 lbs. Pressure.
Ex. Heavy – " " " 600 " "
Hydraulic— " " "1000 " " or over.

CLIMAX.

INSIDE SCREW.
STRAIGHT FACE

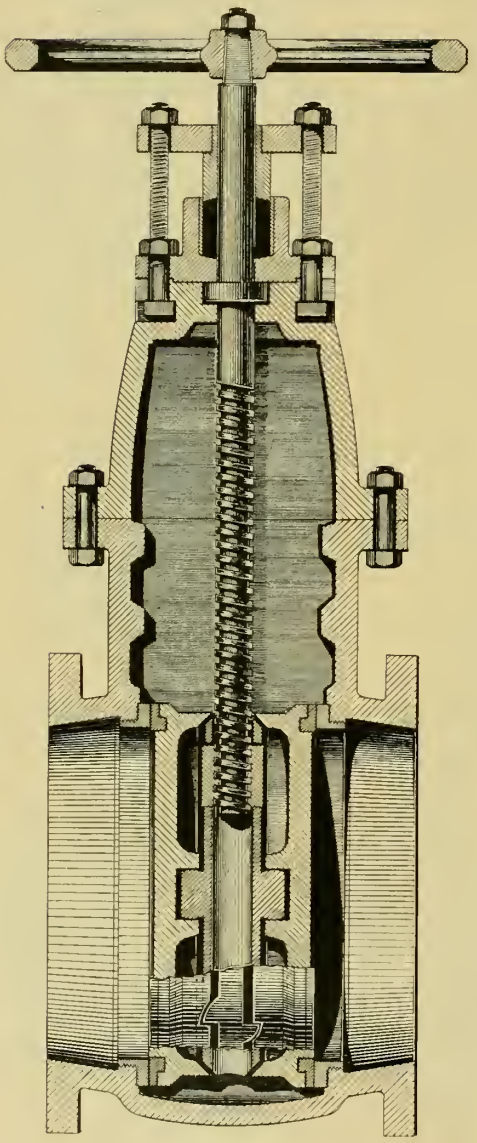


FIG. 205.

Made also with outside screw.

BESTS PATENT DUPLEX.

OUTSIDE SCREW AND YOKE, SELF PACKING STEM
With removable and interchangeable Bronze Seats.
Tested to 600 lbs. Pressure.

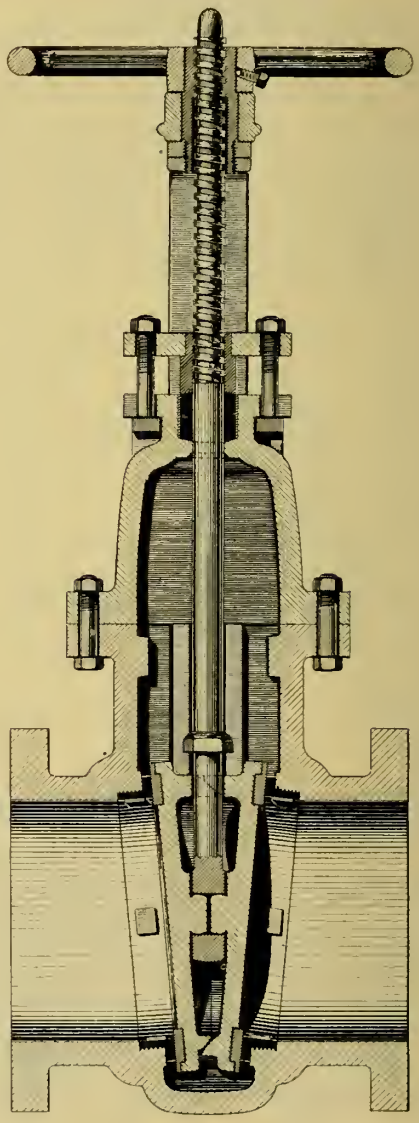


FIG. 206.

Made also with inside screw.

For sizes and dimensions see Table **page 102.**

FIG 205, on opposite side, illustrates a section of our

Climax Double Disc Gate Valve,
WITH - - - - -
Removable Bronze Seats,

Iron Body, Brass Mounted, made in sizes from 2½ to 24 inches inclusive, either screwed, flanged or bowl ends.

The construction of this valve is such that the eccentrics on center ring or wedge bear on back of discs close to the **outer edge** of same. This insures a tight valve, as there can be no springing of discs, as is the case when wedging takes place from the centre only. This valve will **not stick,** but **works freely** at all times and **in any position.**

FIG. 206, on opposite side, illustrates a section of

Best's Patent Duplex Wedge Gate Valve,
WITH - - - - -
Removable Bronze Seats,

Iron Body, Brass Mounted, made in sizes from 2½ to 24 inches inclusive, either screwed, flanged or bowl ends.

This valve is similar to Fig. 208, except wedge disc is made in two parts, and admits of adjustment not obtained with single disc valve, and the strength of discs is not impaired by making same in two pieces. Bronze or steel spindles are made as desired; valves are also made with or without by-pass, using cock, gate or globe valves in by-pass connection. Valves made with or without outside screw.

BEST'S PATENT

SINGLE DISC, EXTRA HEAVY GATE VALVE

WITH

Removable Bronze Seats (that are interchangeable)
Self-Packing Stem—Outside Screw and Yoke.
Ribbed Body or Plain, with or without by-pass.
Tested to 600 lbs. pressure.

SECTION
"BEST'S PATENT" EXTRA HEAVY.
OUTSIDE SCREW AND YOKE.
BY-PASS ON BOTTOM OR SIDE.

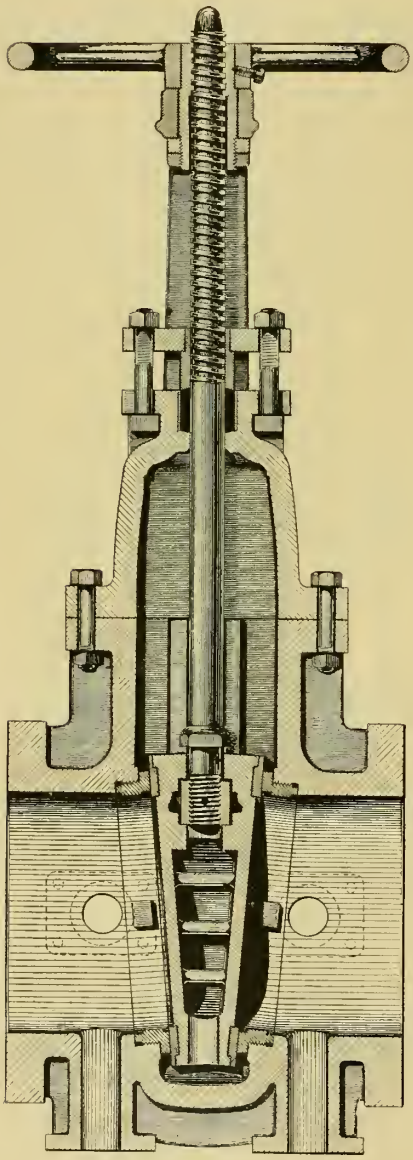


FIG. 207.

"BEST'S PATENT" EXTRA HEAVY.
WITH BY-PASS ON BOTTOM AND 3-WAY COCK IN BY-PASS.

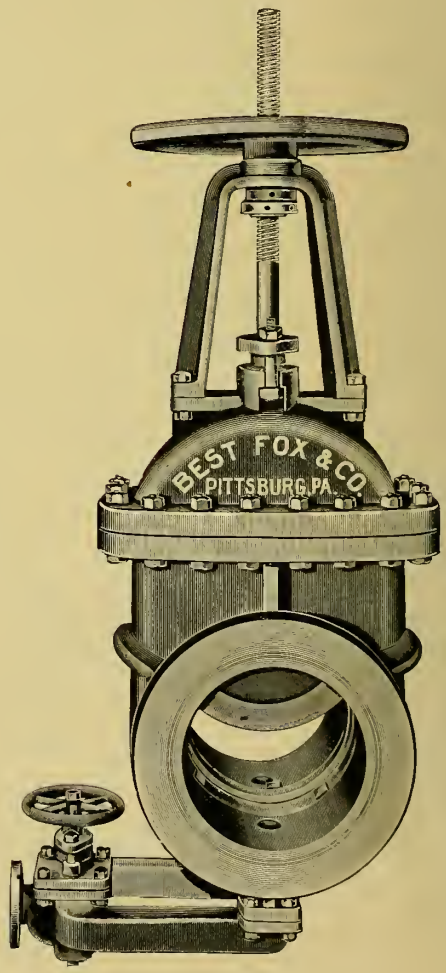


FIG. 208.
Made also with inside screw.

For sizes and dimensions see Table **page 102**

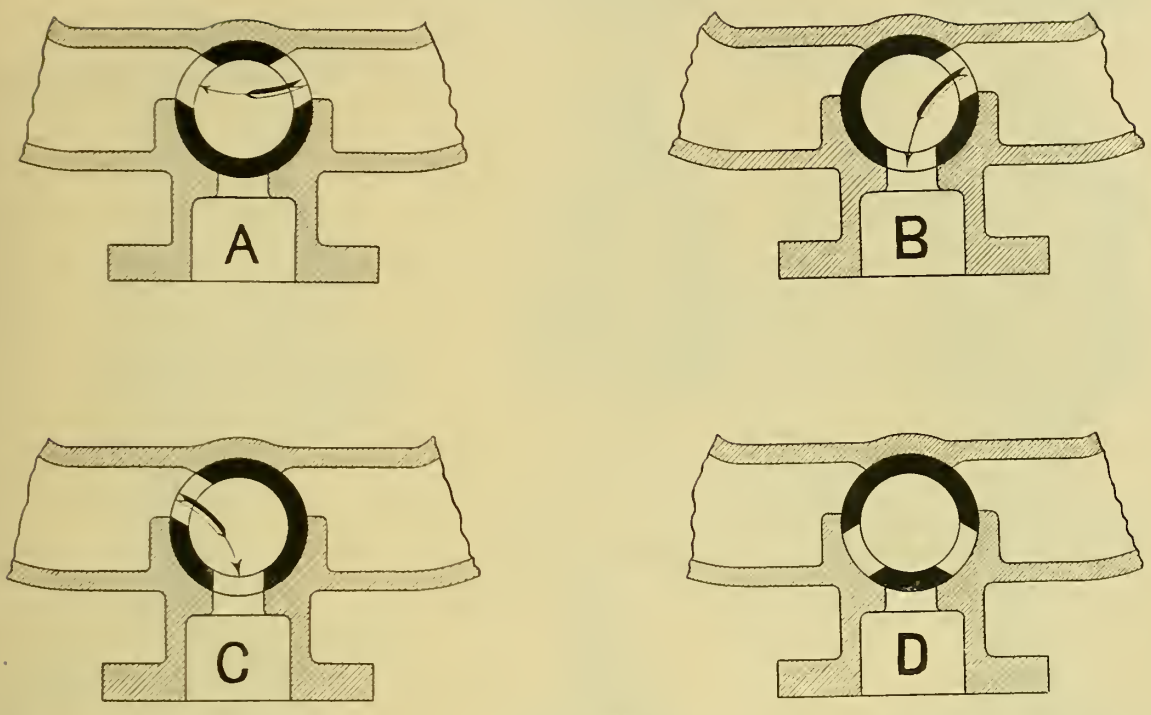


FIG. 209.
TESTED to 600 lbs. Pressure.

On the opposite side we show section and outside elevation of

BEST'S PATENT EXTRA HEAVY WEDGE GATE VALVE

with Renewable Bronze Seats, (that are interchangeable) **Self-Packing Stem,** outside screw and yoke made with or without by-pass. (Note also Fig. 206.)

To meet the large demand for a tight and reliable Gate Valve suitable for Extra Heavy Steam Pressure we have made a special line of patterns from 2½ to 24 inches, having seats that are *readily* removed when necessary, and others inserted in their place and valve be as tight as originally. Disc is faced with bronze, stem made of bronze (or steel, if desired) and gland lined with bronze.

NOTE

The draining feature combined with our by-pass: Three-way cock with brass plug and packing gland is used for this purpose and warranted to work free and easy at all times and not leak.

With key in position as shown in A—Steam is passed to either side of disc.

B—Water is drained from right side of disc.

C—Water is drained from left side of disc.

D—By-pass and drains closed.

By-pass has only 2 joints where branches connect to body of valve. Gate or Globe can be used in place of cock if so desired and draining feature is not required. By-pass connection made on bottom or side.

IRON BODY. CHAPMAN GATE VALVES. BRASS MOUNTED

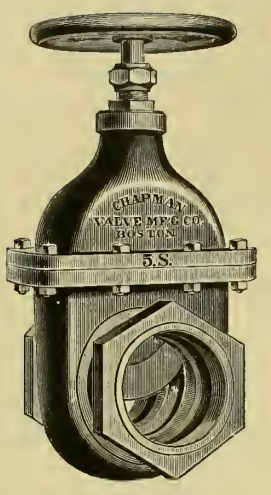


FIG. 210.
SCREWED.

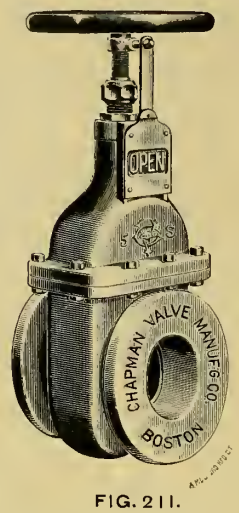


FIG. 211.
FLANGED.
WITH INDICATOR.

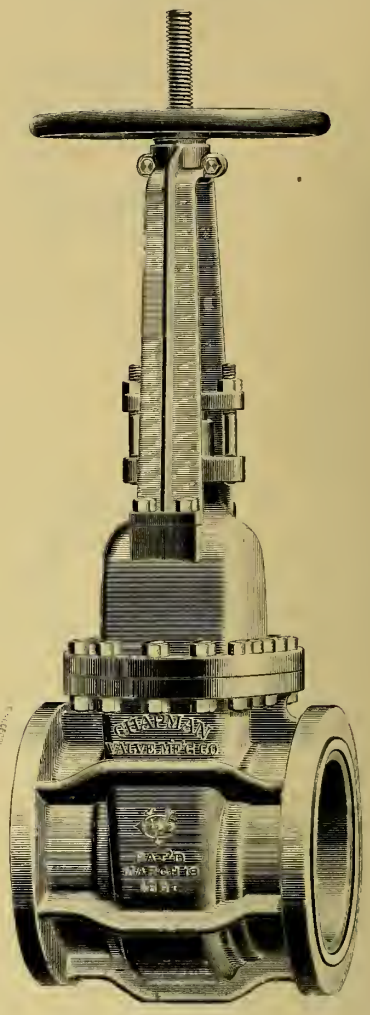


FIG. 212.
ARCH TOP.
FOR HEAVY PRESSURE.

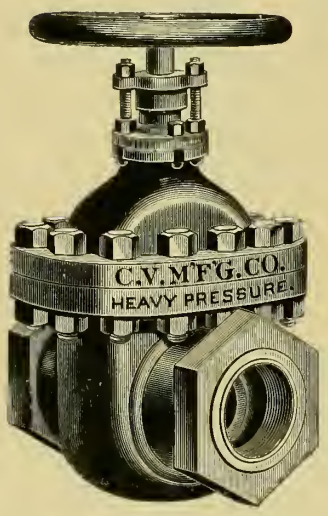


FIG. 213.
SCREWED.
FOR EXTRA HEAVY PRESSURE.

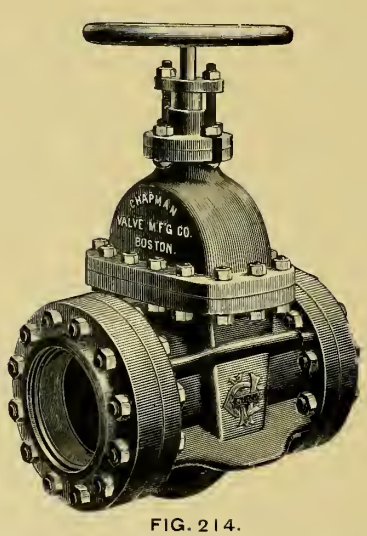


FIG. 214.
FLANGED.
FOR EXTRA HEAVY PRESSURE.

IRON BODY. KENNEDY GATE VALVES. BRASS MOUNTED.

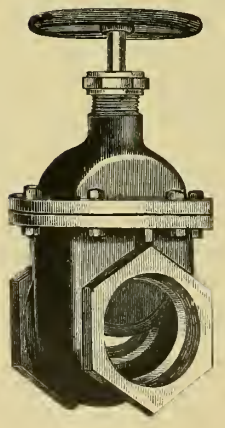


FIG. 215.
SCREWED.

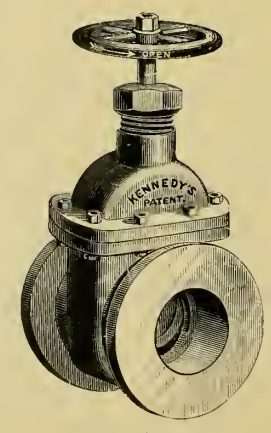


FIG. 216.
FLANGED.
DESCRIPTIVE CIRCULAR ON APPLICATION.

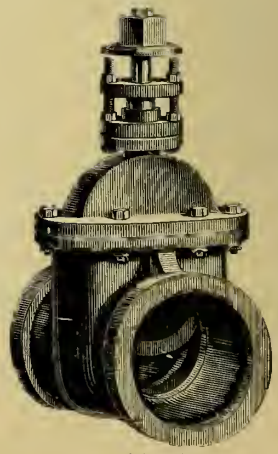


FIG. 217.
OWL OR HUB ENDS.

FAIRBANKS GATE VALVES.

FIG. 218.
ALL BRASS ASBESTOS DISC.
SCREWED OR FLANGED.

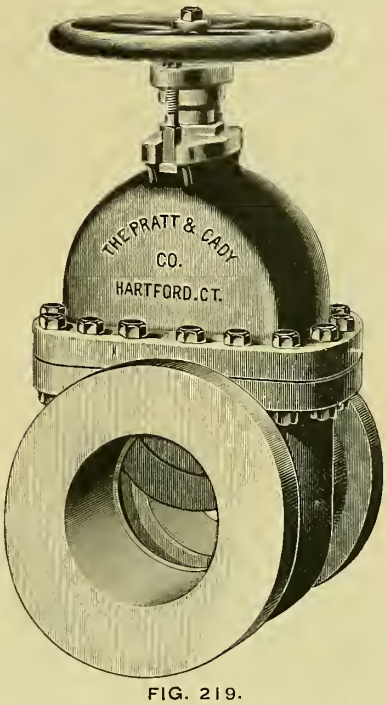


FIG. 219.
IRON BODY ASBESTOS DISC.
SCREWED OR FLANGED.

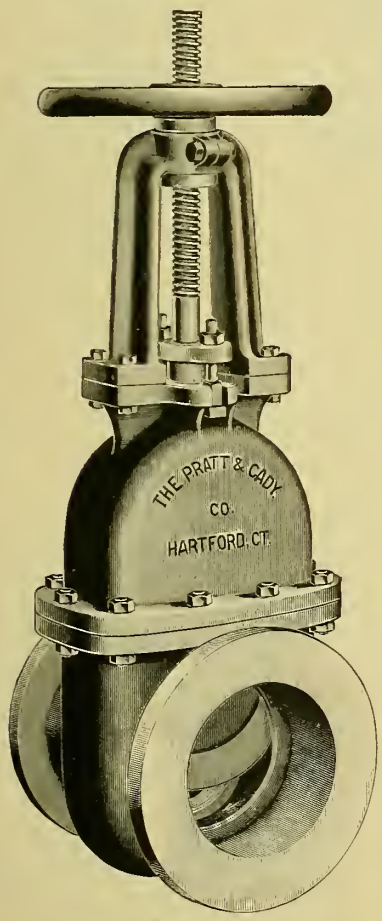


FIG. 220.
IRON BODY FLANGED.
REMOVABLE BRONZE SEAT—ARCH TOP.

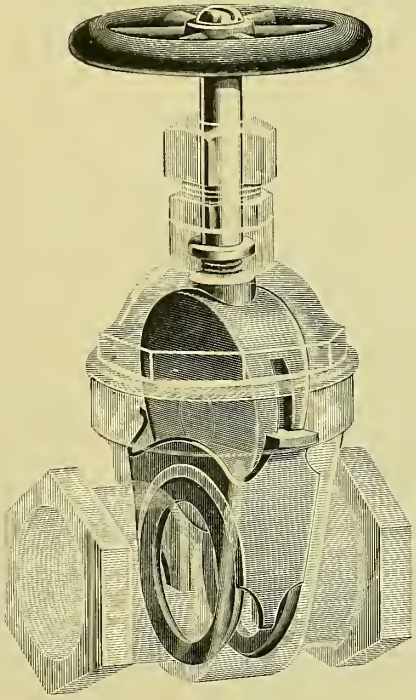


FIG. 221.
IRON BODY SCREWED.
REMOVABLE BRONZE SEAT—SCREWED BONNET.

Descriptive Circular on Application.

IRON COCKS

WITH IRON OR BRASS PLUGS.

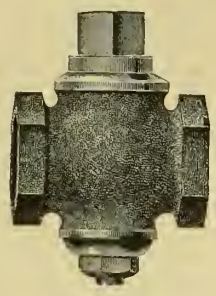


FIG. 222.
SCREWED.
SQUARE HEAD.

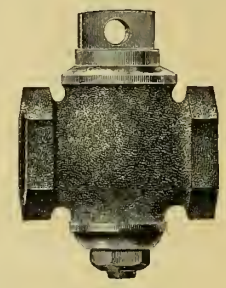


FIG. 223.
SCREWED.
FLAT HEAD.

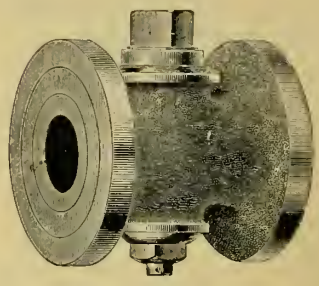


FIG. 224.
FLANGED.
SQUARE OR FLAT HEAD

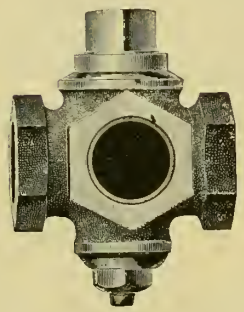


FIG. 225.
THREE-WAY.
SCREWED OR FLANGED.

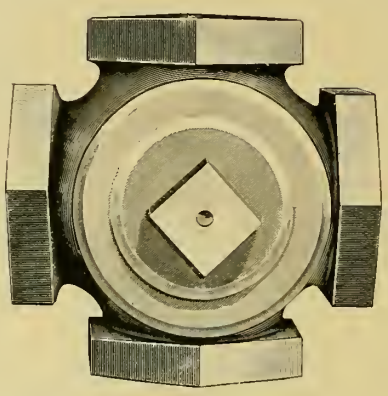


FIG. 226.
FOUR-WAY.
SCREWED OR FLANGED.

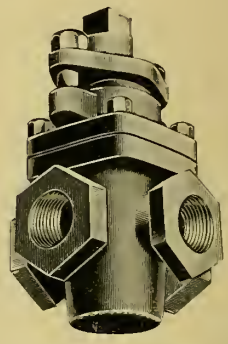


FIG. 227.
FOUR-WAY.
(WITH PACKED GLAND.)
SCREWED OR FLANGED.

IRON AND BRASS. ASBESTOS PACKED COCKS. SCREWED AND FLANGED

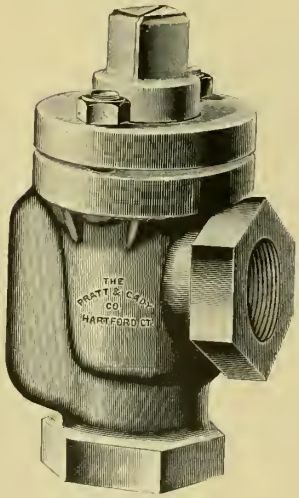


FIG. 228.
ANGLE.

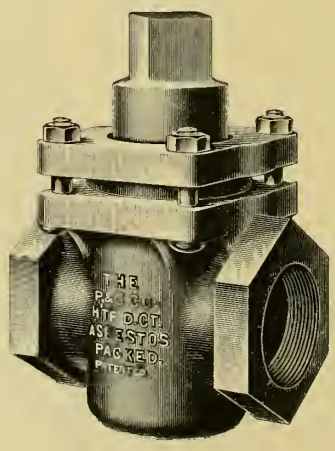


FIG. 229.
TWO-WAY.

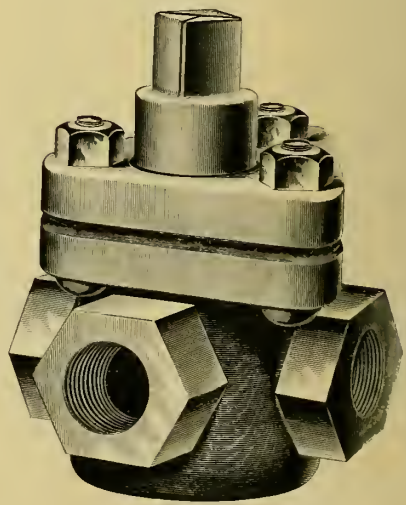


FIG. 230.
THREE-WAY.

Descriptive Circular on Application.

MYER'S PATENT BLOW-OFF VALVE.

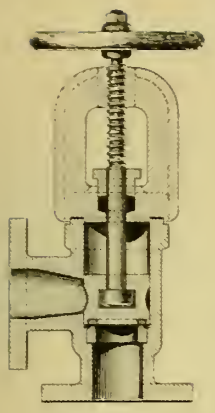


FIG. 231.
SECTION.

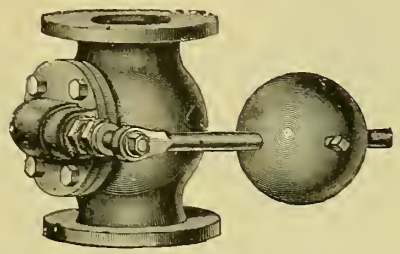


FIG. 233.
BACK PRESSURE VALVE,
SCREWED AND FLANGED,
FOR HORIZONTAL OR VERTICAL LINES.

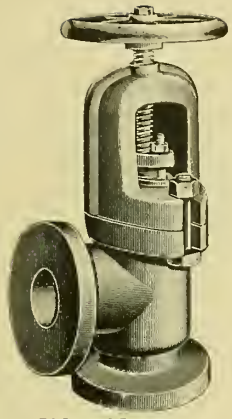


FIG 232.
FLANGED.

EXPANSION JOINTS.

FIG. 234.
IRON BODY
SCREWED

FIG. 235.
IRON BODY.
FLANGED.

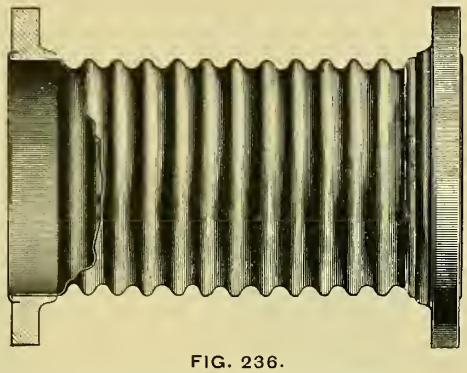


FIG. 236.
CORRUGATED COPPER.
SCREWED OR FLANGED.

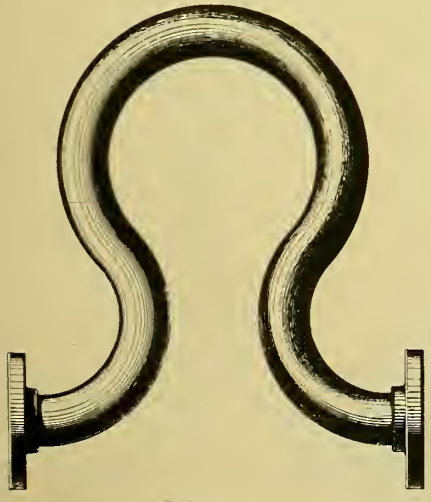


FIG. 237
COPPER.

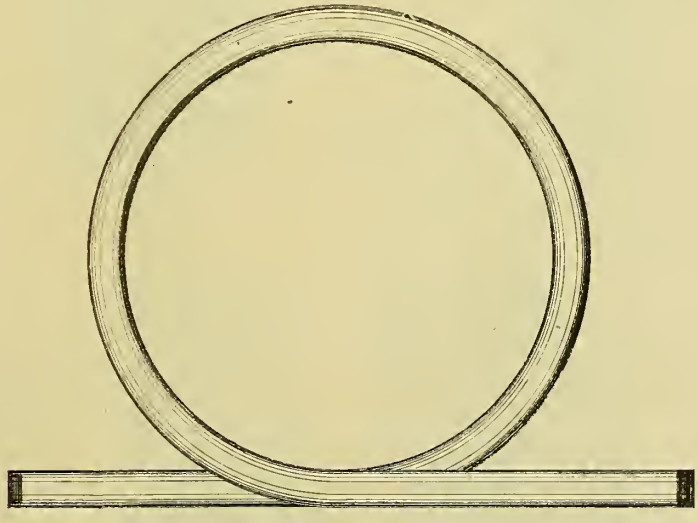


FIG. 238.
IRON PIPE OR LOOP EXPANSION.

For Sizes and Dimensions, see Table **page 104**.

FOOT VALVES AND STRAINERS.

FOOT VALVES. STRAINERS.

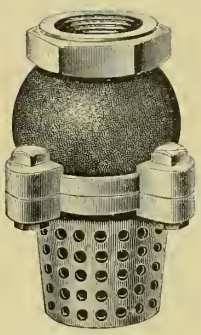


FIG. 239.
SCREWED.

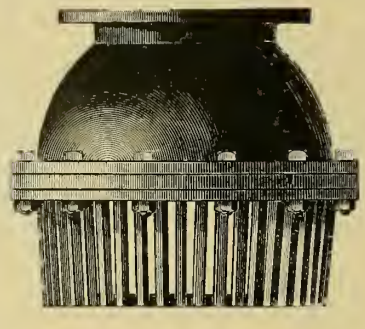


FIG. 240.
FLANGED.

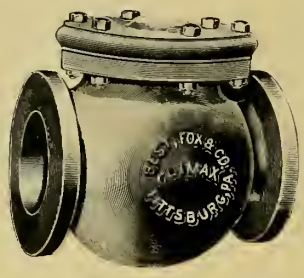


FIG. 241.
GLOBE BODY.
SCREWED OR FLANGED.

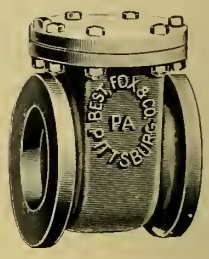


FIG. 242.
GATE BODY.
SCREWED OR FLANGED.

For Sizes and Dimensions see Table **page 104.**

STRAINERS.

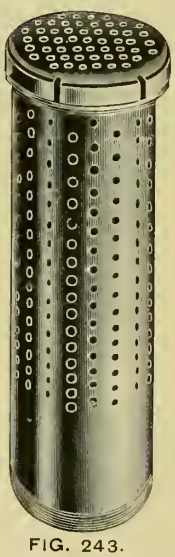


FIG. 243.
WROT. IRON PIPE.
DRILLED.

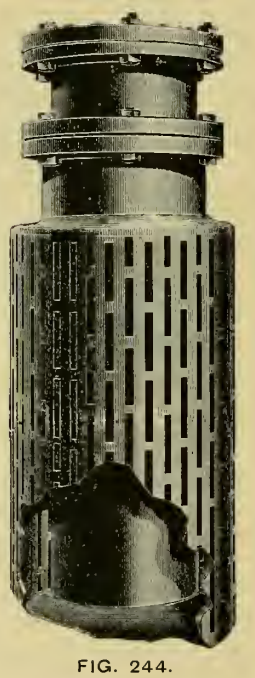


FIG. 244.
CAST IRON.
SLOTTED.

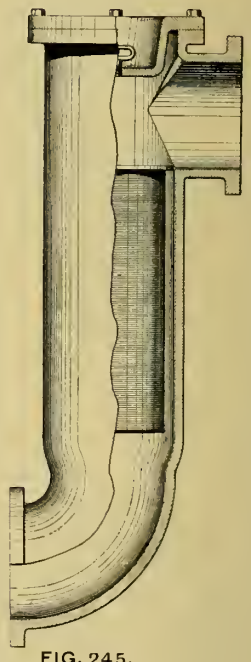


FIG. 245.
PUMP STRAINER.
WITH BASKET.

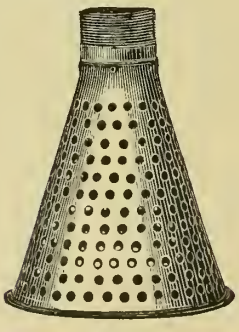


FIG. 246.
WROUGHT IRON.
GALVANIZED.

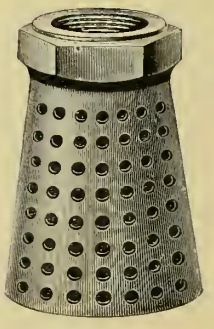


FIG. 247.
CAST IRON.

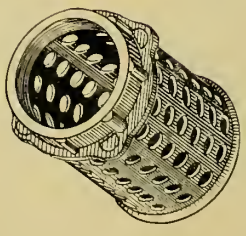


FIG. 248.
MALLEABLE IRON.

FIG. 249.
FOR SYPHON PUMPS.

BRASS VALVES.

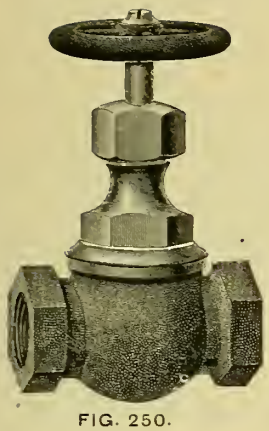


FIG. 250.
GLOBE VALVE.

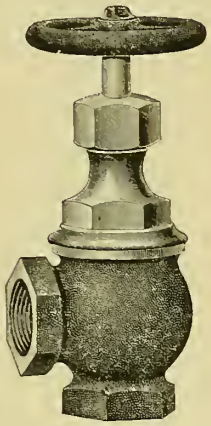


FIG. 251.
ANGLE VALVE.

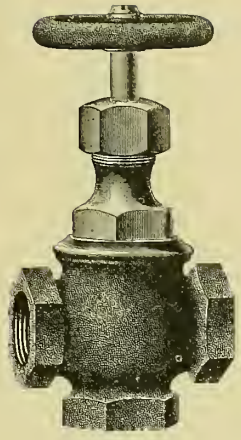


FIG. 252.
CROSS VALVE.

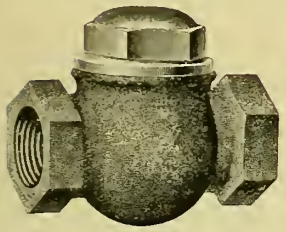


FIG. 253.
CHECK VALVE.
HORIZONTAL.

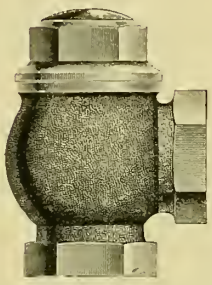


FIG. 254.
CHECK VALVE.
ANGLE.

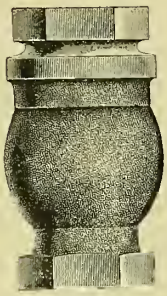


FIG. 255.
CHECK VALVE.
VERTICAL.

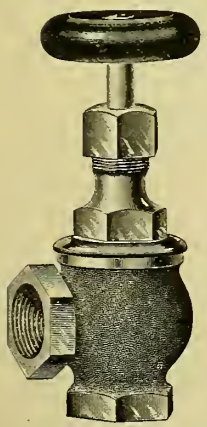


FIG. 256.
RADIATOR VALVE.
FEMALE.

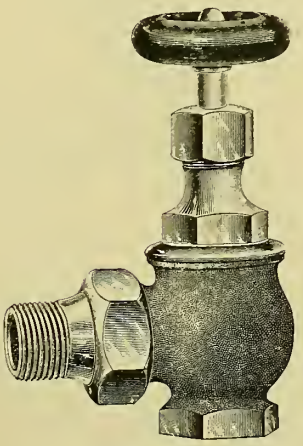


FIG. 257.
RADIATOR VALVE.
WITH UNION.

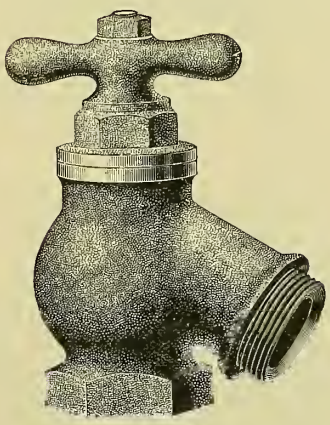


FIG. 258.
COKE-OVEN VALVE.

For Dimensions see Table **page 103.**

POWELL'S STAR RE-GRINDING VALVES.—BRASS.

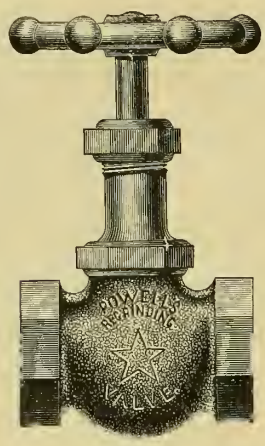


FIG. 259.
GLOBE VALVE.

FIG. 260.
ANGLE VALVE.

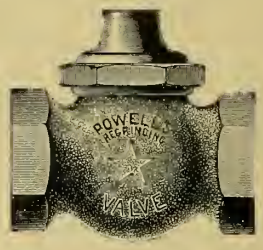


FIG. 261.
CHECK VALVE.

ASBESTOS DISC BRASS VALVES.

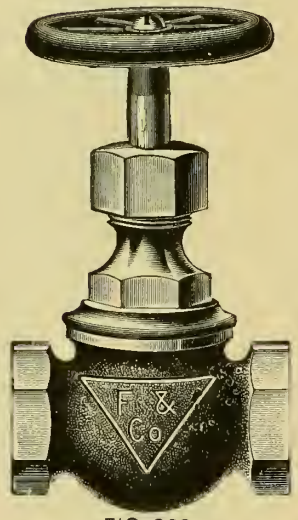


FIG. 262.
GLOBE VALVE.

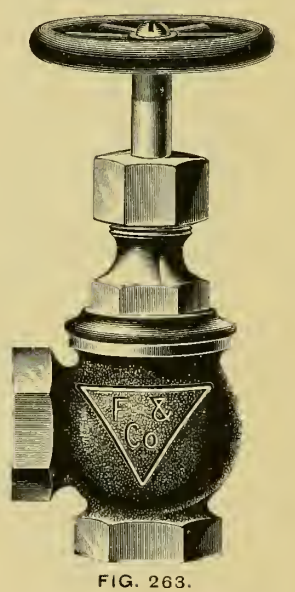


FIG. 263.
ANGLE VALVE.

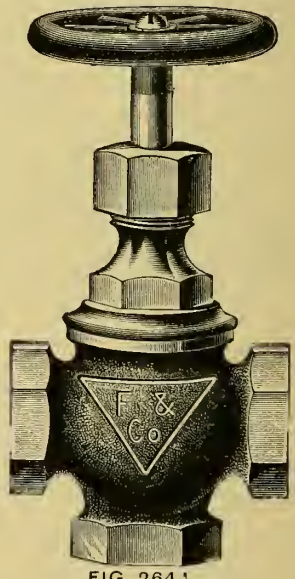


FIG. 264.
CROSS VALVE

SWINGING CHECK VALVES.—ROTATING DISC.

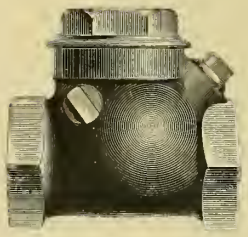


FIG. 265.
HORIZONTAL OR
VERTICAL.

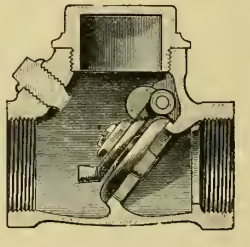


FIG. 266.
HORIZONTAL.
SECTION

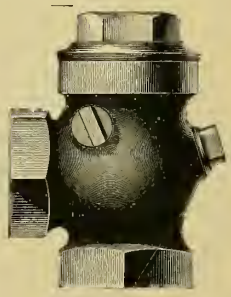


FIG. 267.
ANGLE.

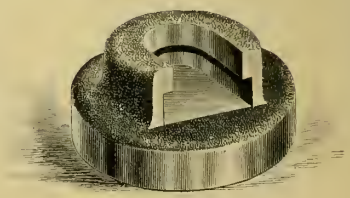


FIG. 268.
ASBESTOS DISC AND
HOLDER COMPLETE.
FOR ALL SIZES

JENKINS' BRASS VALVES.

FIG. 269.
ANGLE VALVE.

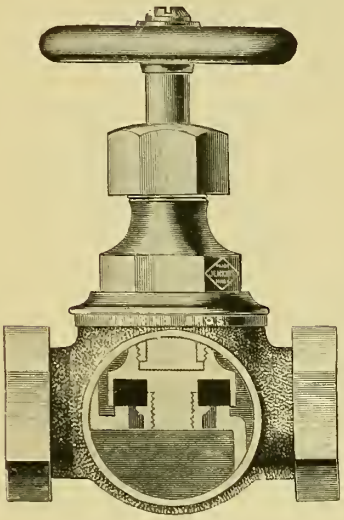


FIG. 270.
GLOBE VALVE.

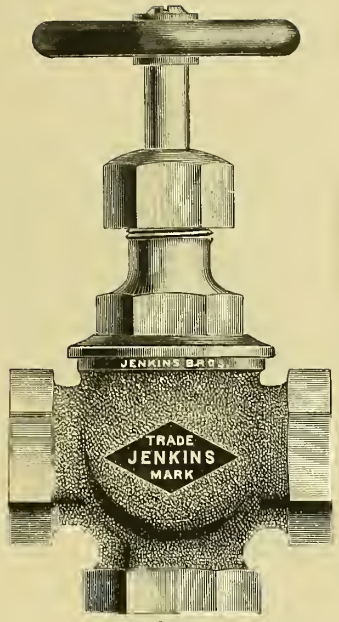


FIG. 271.
CROSS VALVE.

FIG. 272.
CHECK VALVE.
HORIZONTAL.

FIG. 273.
CHECK VALVE.
ANGLE.

FIG. 274.
CHECK VALVE
VERTICAL.

JENKINS' STANDARD.

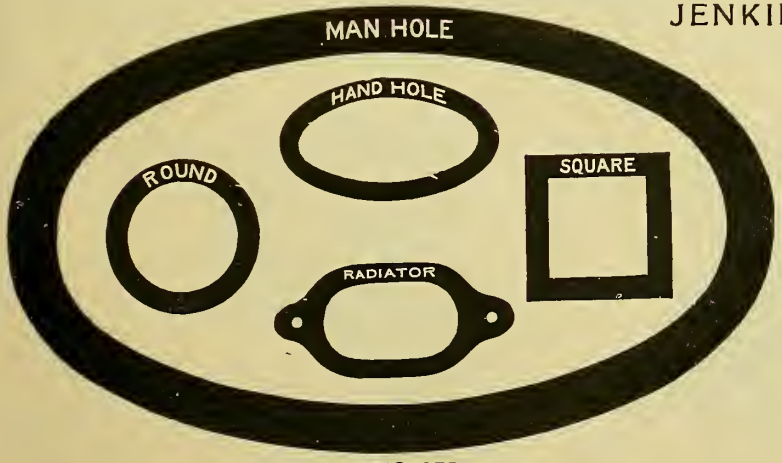


FIG. 275.

GASKETS.
ALL SIZES.

DISCS
FROM ¼ TO 24 INCH DIAM.

FIG. 276.

BRASS VALVES.

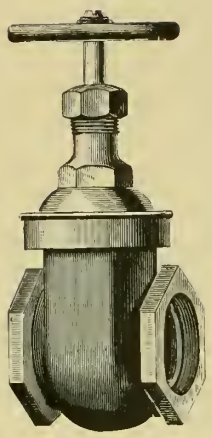


FIG. 277.
GATE VALVE.

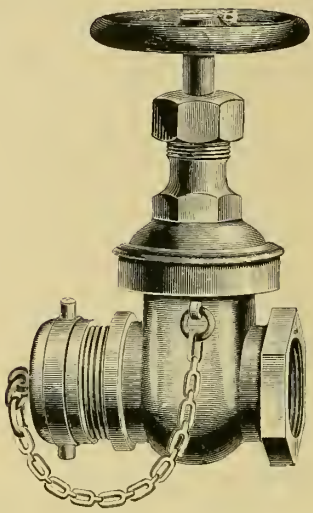


FIG. 278.
GATE VALVE
WITH HOSE CAP.

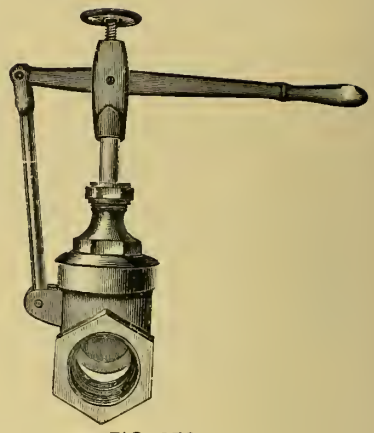


FIG. 279.
GATE VALVE.
QUICK OPENING.

For Dimensions, see Table **page 103.**

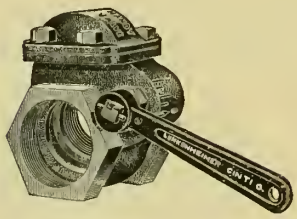
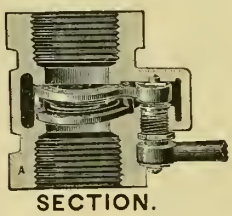


FIG. 280.
HANDY GATE VALVE.
LUNKENHEIMERS.



SECTION.

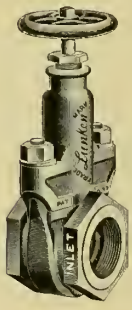


FIG. 281.
LUNKEN GATE VALVE.
BRASS AND IRON.

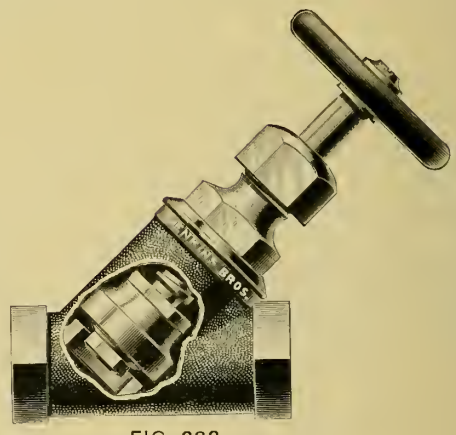


FIG. 282.
Y VALVE.

BRASS SAFETY VALVES.

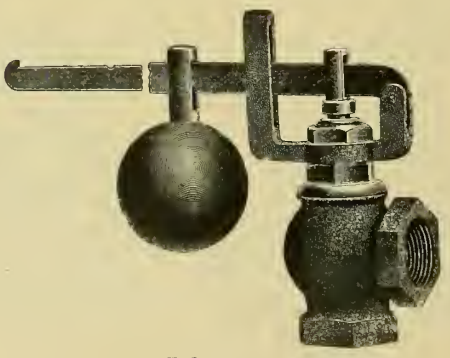


FIG. 283.
ANGLE.

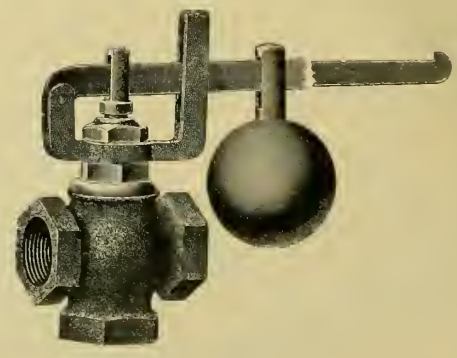


FIG. 284
THREE-WAY.

BRASS COCKS.

FIG. 285.
SQUARE HEAD.

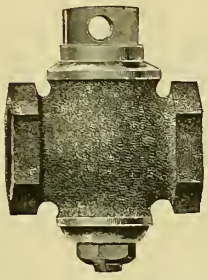


FIG. 286.
FLAT HEAD.

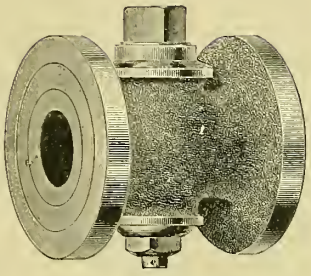


FIG. 287.
SQ. AND FLAT HEAD.
FLANGED.

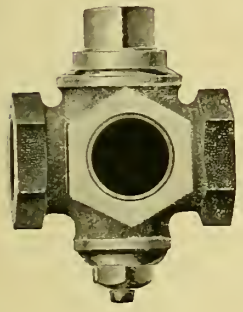


FIG. 288.
THREE WAY.

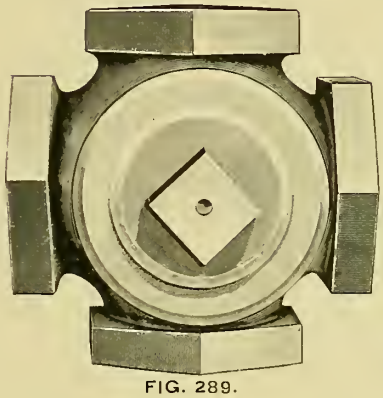


FIG. 289.
FOUR WAY.

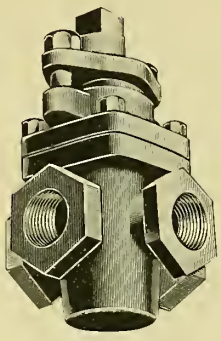


FIG. 290.
FOUR WAY.
WITH PACKED GLAND.
SCREWED AND FLANGED.

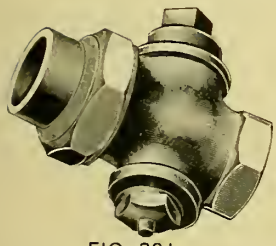


FIG. 291.
COCK, WITH COUPLING.

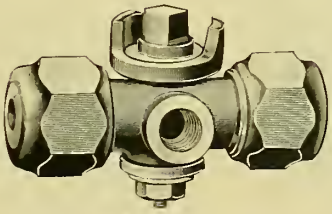


FIG. 292.
HYDRAULIC COCK.
WITH COUPLING NUTS

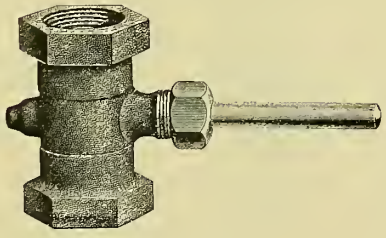


FIG. 293.
BUTTERFLY VALVE.

FIG. 294.
COCK WRENCHES.
ALL SIZES.

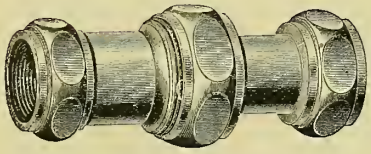


FIG. 295.
BRASS EXPANSION JOINT.

Special Cocks to Order.

TUYERE COCKS AND UNIONS.—GROUND JOINTS.

FIG. 296.
TUYERE COCK (New Style.)
WITHOUT COUPLING.

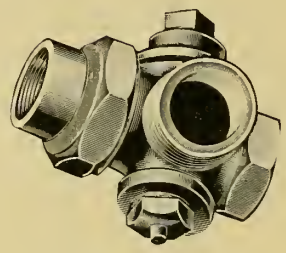


FIG. 297.
TUYERE COCK (Old Style.)
WITH COUPLING FOR IRON OR LEAD PIPE.

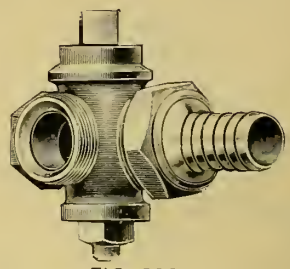


FIG. 298.
TUYERE COCK (Old Style.)
WITH COUPLING FOR HOSE.

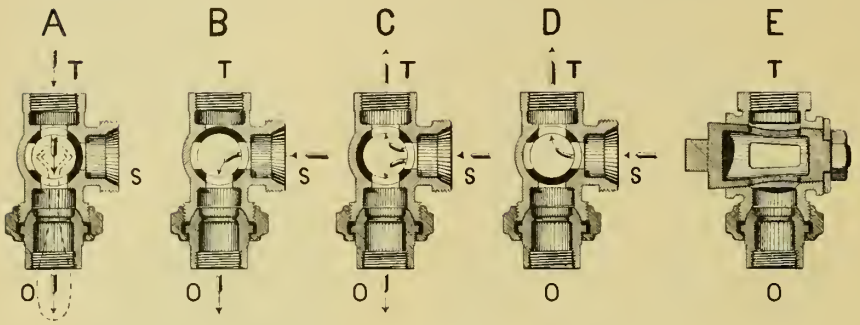


FIG. 299.
OLD STYLE TUYERE COCK.
SECTION.

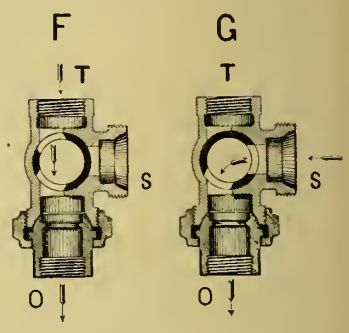


FIG. 300.
NEW STYLE TUYERE COCK.
SECTION.

BRASS UNIONS.—GROUND JOINTS.

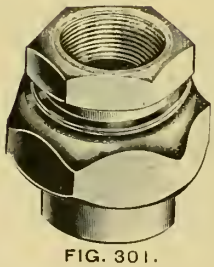


FIG. 301.
HEAVY.
FOR IRON PIPE

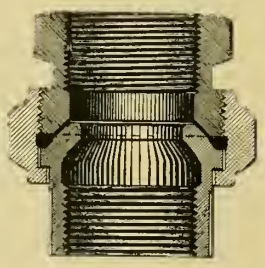


FIG. 302.
HEAVY.
SECTION.

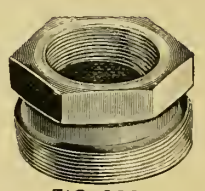


FIG. 303.
MALE HALF
OF UNION

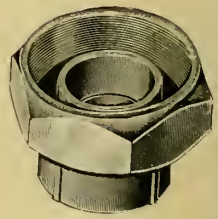


FIG. 304.
FEMALE HALF
OR NUT AND SWIVEL.

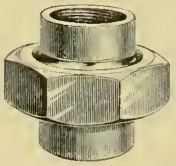


FIG. 305.
STANDARD.

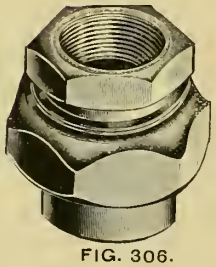


FIG. 306.
HEAVY
FOR IRON AND LEAD PIPE.

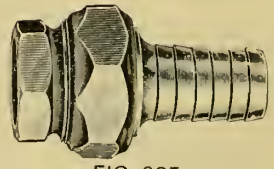


FIG. 307.
HEAVY
FOR IRON PIPE AND HOSE.

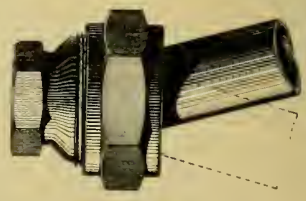


FIG. 308.
UNIVERSAL.

STANDARD BRASS FITTINGS.

ROUGH OR FINISHED.

FIG. 309.
90° ELBOW.

FIG. 310.
45° ELBOW.

FIG. 311.
TEE.

FIG 312.
CROSS.

FIG. 313.
REDUCER.

FIG. 314.
PLUG.
SQUARE HEAD.

FIG. 315.
PLUG.
COUNTERSUNK HEAD.

FIG. 316.
CAP.

FIG. 317.
LOCKNUT.

FIG. 318.
BUSHING.

FIG. 319.
RETURN BEND.
OPEN.

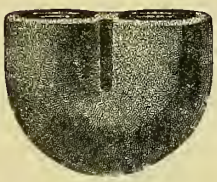


FIG. 320.
RETURN BEND.
CLOSE.

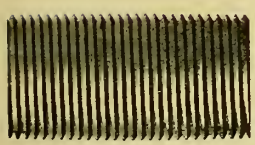


FIG. 321.
CLOSE NIPPLE.

FIG. 322.
SHOULDER NIPPLE.

FIG. 323.
SOCKET OR COUPLING.

FIG 324.
SOCKET.
RIGHT AND LEFT.

Reducing and Special Fittings to order. Copper Plugs to order.

AIR AND CYLINDER COCKS.

FIG. 325.
TEE HANDLE.

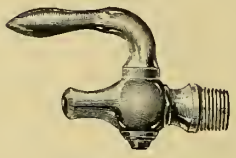


FIG. 326.
LEVER HANDLE.

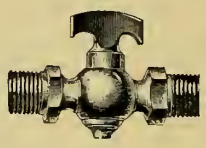


FIG. 327.
DOUBLE THREAD,
MALE.

FIG. 328.
DOUBLE THREAD,
FEMALE.

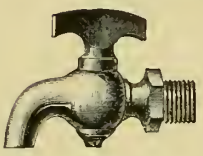


FIG. 329.
BIBB NOZZLE.
TEE HANDLE.

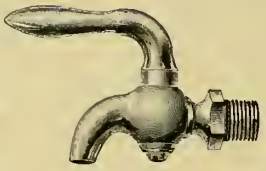


FIG. 330.
BIBB NOZZLE.
LEVER HANDLE.

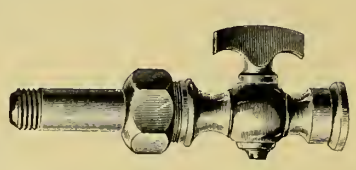


FIG. 331.
CYLINDER COCK.
WITH UNION, TEE HANDLE.

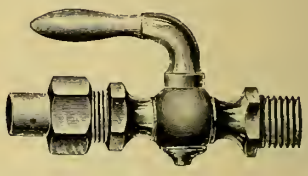


FIG. 332
CYLINDER COCK.
WITH UNION, LEVER HANDLE.

GAUGE COCKS.

FIG. 333.
MISSISSIPPI.

FIG. 334
COMPRESSION.

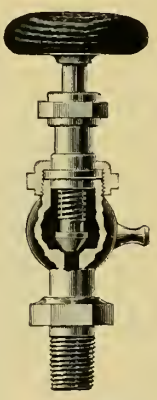


FIG. 335
COMPRESSION.
REGRINDING.

FIG. 336.
REGISTER.

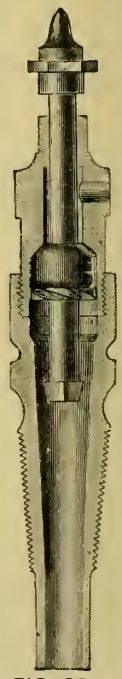


FIG. 337.
BINGHAM
REGRINDING.

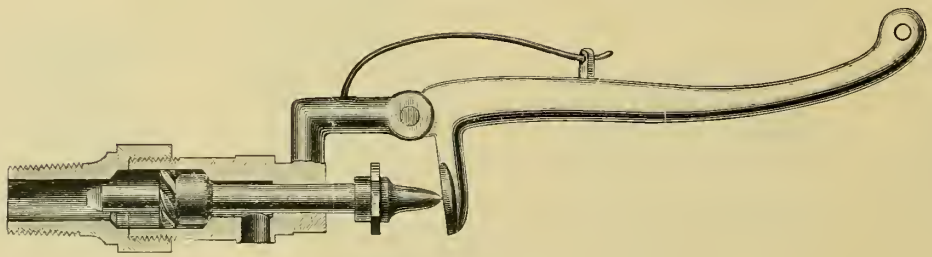


FIG. 338.
BINGHAM REGRINDING WITH LEVER.

Threads Chased to Order.

WATER GAUGES.

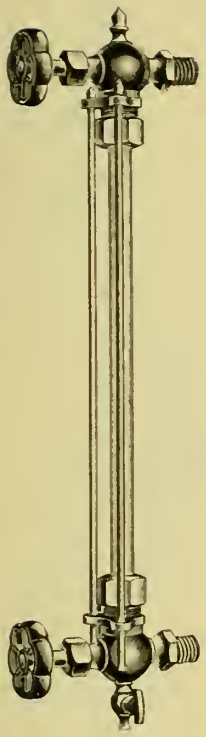


FIG. 339
NO. 4.
12x⅜ GLASS TUBE.

FIG. 340
NO. 6.
12x⅜ GLASS TUBE.

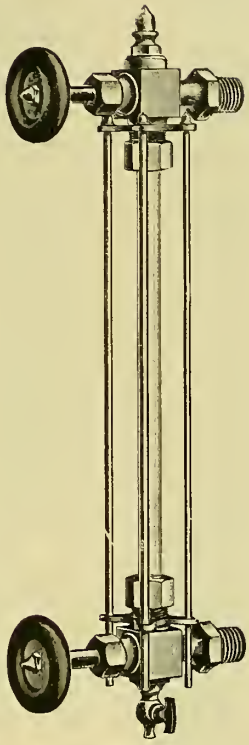


FIG 341.
NO. 7.
12x⅜ GLASS TUBES

Water Gauges with longer and larger tubes furnished from stock.

WHISTLES.

FIG. 342.
PLAIN.

FIG. 343.
WITH VALVE.

FIG. 344.
WHISTLE VALVE.

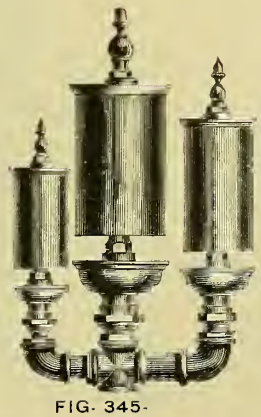


FIG. 345.
CHIME.

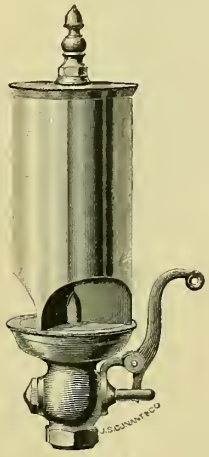


FIG. 346.
CHIME,
IN ONE WHISTLE.

WATER GAUGE COLUMNS.

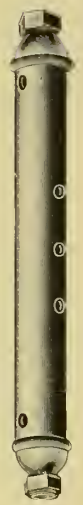


FIG. 347.
NO. 1.

FIG. 348.
NO. 2.

FIG. 349.
NO. 6.
COMPLETE

FIG. 350.
GLASS TUBES.

FIG. 351.
GUM WASHERS.
FOR GLASS TUBES.

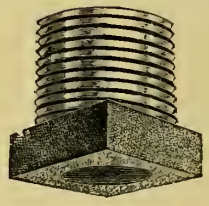


FIG. 352.
FUSIBLE PLUG.

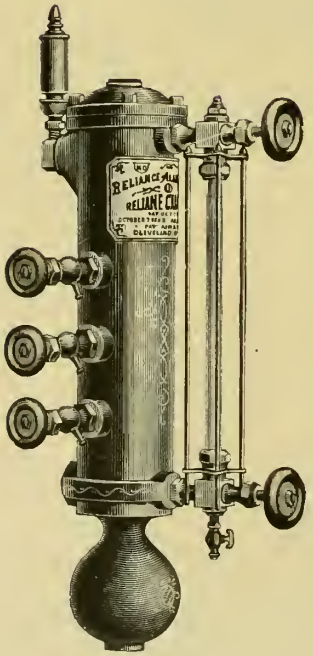


FIG. 353.
RELIANCE SAFETY.
HIGH AND LOW WATER COLUMN

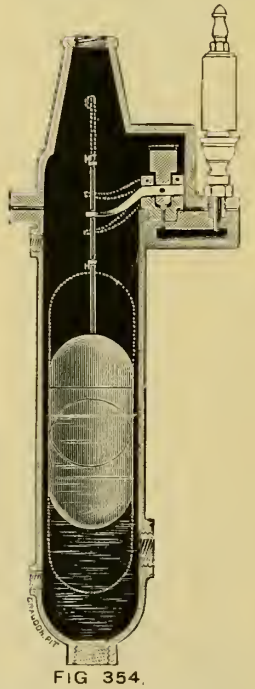


FIG 354.
WILLIAMS' SAFETY.
HIGH AND LOW WATER COLUMN

FIG. 355.
WILLIAMS' SAFETY.
HIGH AND LOW WATER INDICATOR.

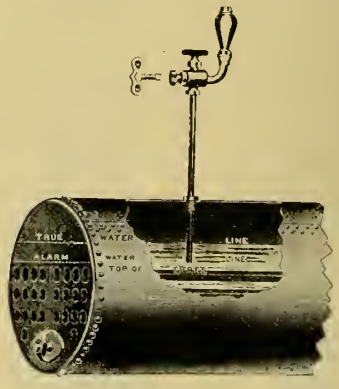


FIG 356
CRANE'S
LOW WATER ALARM.

Descriptive Circular on Application.

BRASS OIL CUPS.

FIG 357.
PLAIN.

FIG. 358.
LOCOMOTIVE.

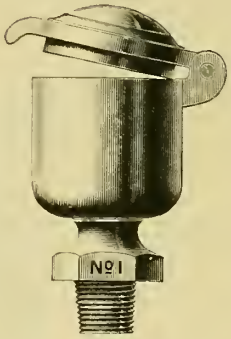


FIG. 359.
HINGE LID.

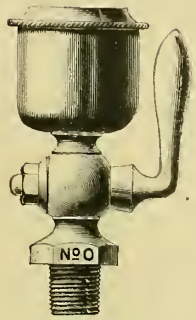


FIG. 360.
LEVER HANDLE.

GLASS OIL CUPS.

FIG. 361.
PIONEER.
SLIDE TOP.

FIG. 362.
ROYAL.
SIGHT FEED.

FIG 363.
CROWN.
INDEX SIGHT FEED.

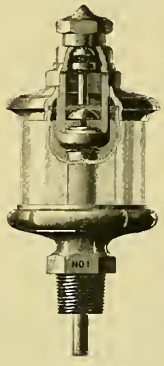


FIG. 364.
ROD CUP.
FOR CRANK PINS.

FIG. 365
AJAX.
INDEX.

FIG. 366
RIVAL.
SIGHT FEED.

FIG. 367.
CODY'S
SHAFT CUP.

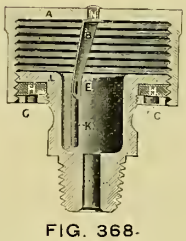


FIG. 368.
GREASE CUP.

All Sizes of above Cups.

Descriptive Circular on Application.

LUBRICATORS.

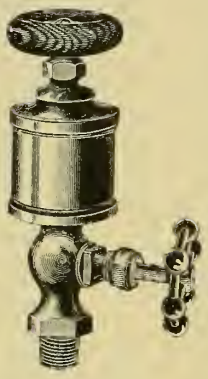


FIG. 369.
PLAIN.

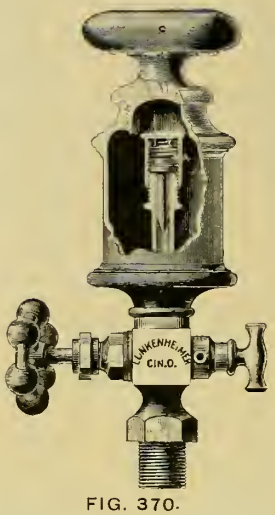


FIG. 370.
AUTOMATIC OIL FEEDER.
(NEEDLE VALVE.)

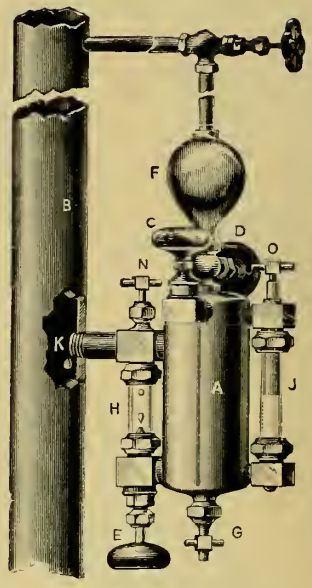


FIG. 371.
DETROIT SIGHT FEED.

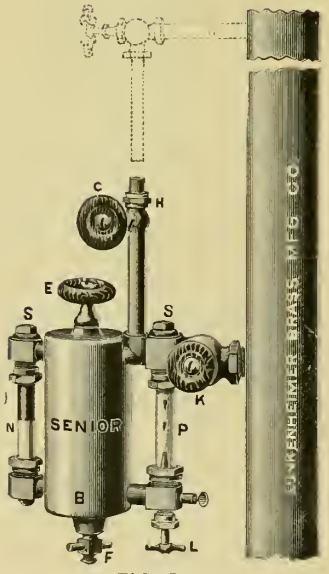


FIG. 372.
SENIOR
SIGHT FEED

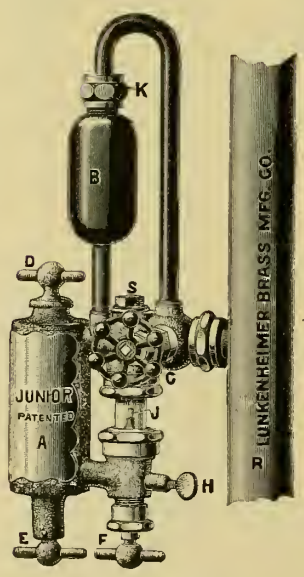


FIG. 373.
JUNIOR.
SIGHT FEED.

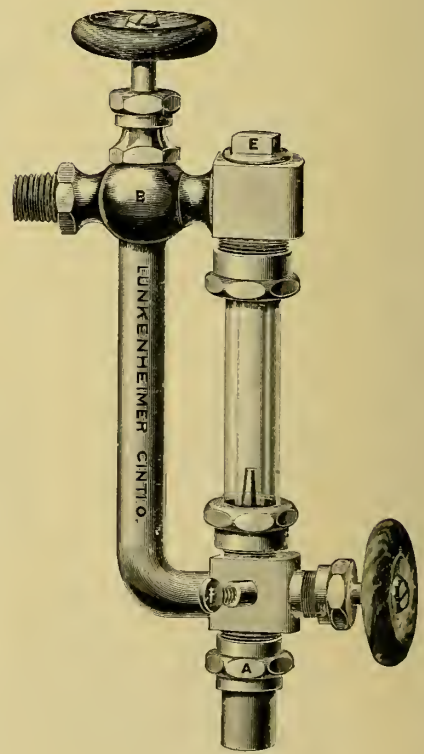


FIG. 374
INDEPENDENT.
SIGHT FEED.

Descriptive Circulars of above on Application.

HOSE CONNECTIONS.

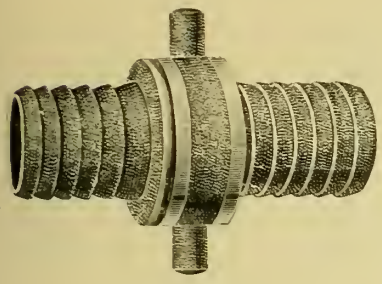


FIG 375.
HOSE COUPLING.

FIG. 376.
NOZZLE.
PLAIN.

FIG 377.
NOZZLE.
WITH COCK.

FIG 378.
HEAVY IRON NOZZLE.
BRASS NUT.

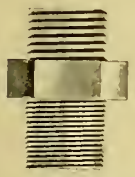


FIG. 379.
HOSE NIPPLE.

FIG 380.
HOSE CLAMP.

FIG 381.
CALDWELL HOSE CLAMP.

FIG. 382.
TUERK HOSE CLAMP.

HEAVY GAS FIXTURE FITTINGS,

FOR FACTORY AND MILL USE.

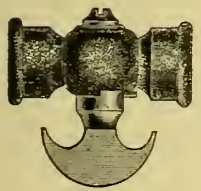


FIG. 383.
PENDANT COCK.
STRAIGHT.

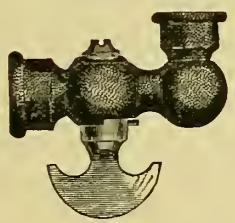


FIG. 384.
PENDANT COCK.
ELBOW.

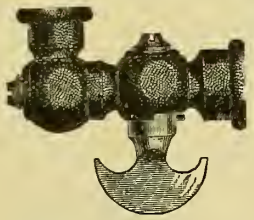


FIG. 385.
PENDANT COCK.
SWING.

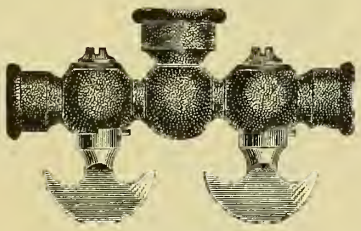


FIG. 386.
DOUBLE CENTER COCK.

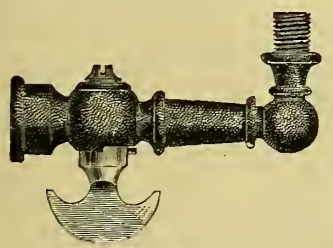


FIG. 387.
ELBOW BURNER COCK.

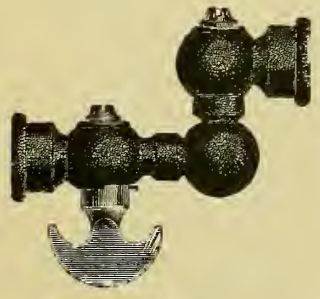


FIG. 388.
SWING JOINT.
WITH COCK.

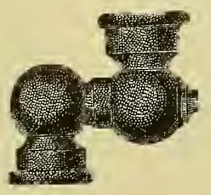


FIG. 389.
SWING JOINT.

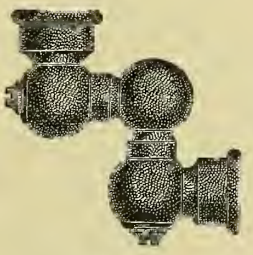


FIG. 390.
UNIVERSAL SWING JOINT.

Burners and Brackets for above in Stock.

GAS FIXTURES AND BURNERS.

FIG. 391.
IRON BURNER.
BAT WING.

FIG. 392.
IRON BURNER.
FISH TAIL.

FIG. 393.
BRASS PILLAR.
FOR LAVA TIP.

FIG. 394.
MACKLEY BURNER.
FOR NATURAL GAS.

FIG. 395.
JUMBO BURNER.
FOR NATURAL GAS.

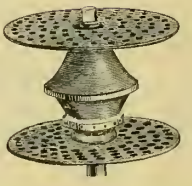


FIG. 396.
IRWIN STORM BURNER.
FOR NATURAL GAS.

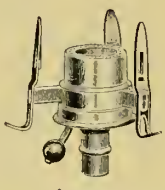


FIG. 397.
ARGAND BURNER.
AUTOMATIC.

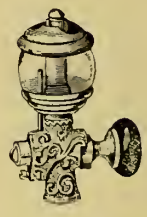


FIG. 398.
EUREKA BURNER.
SELF-LIGHTING.

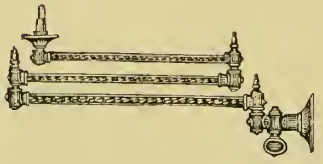


FIG. 399.
THREE SWING.
STRAIGHT BRACKET.

FIG. 400.
DOUBLE SWING.
STRAIGHT BRACKET UNIVERSAL.

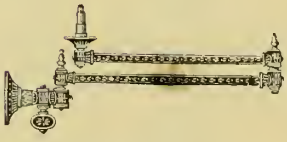


FIG. 401.
DOUBLE SWING.
STRAIGHT BRACKET.

FIG. 402.
SINGLE SWING.
STRAIGHT BRACKET.

FIG. 403.
STRAIGHT BRACKET.
STIFF.

FIG. 404.
C BEND BRACKET.
STIFF.

FIG. 405.
C BEND SINGLE SWING.
BRACKET.

FIG. 406.
S BEND BRACKET.

Iron and Lava Tips in Stock.

BRASS
CAST STEEL
" IRON

HYDRAULIC FITTINGS AND COCKS

FROM 500 LBS. TO 3000 LBS. PRESSURE

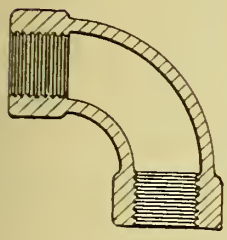


FIG. 407.
ELBOW.

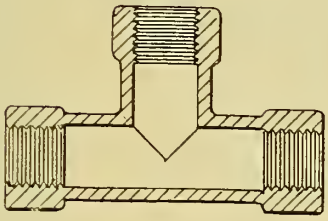


FIG. 408.
TEE.

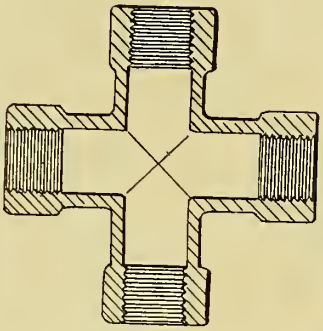


FIG. 409.
CROSS.

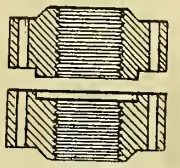


FIG. 410.
FLANGED UNION.

JONES' PATENT HOSE COUPLING for Steam and Hydraulic Pressure.

FIG. 414.
FEMALE HALF.

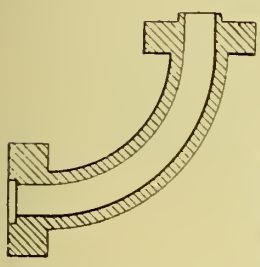


FIG. 411.
FLANGED ELBOW.

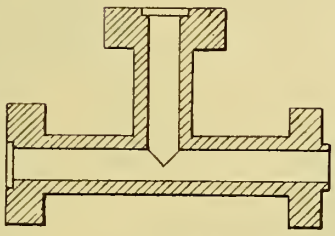


FIG. 412.
FLANGED TEE.

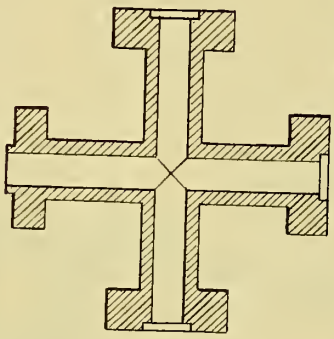


FIG. 413.
FLANGED CROSS.

FIG. 415.
MALE HALF.

FIG. 416.
FOLLOWER.

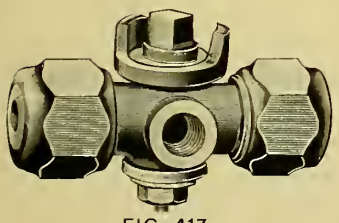


FIG. 417.
HYDRAULIC.
BRASS COCK.

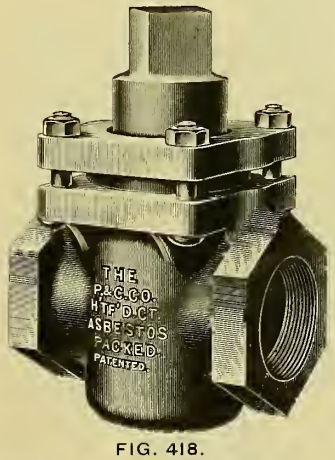


FIG. 418.
HYDRAULIC ASBESTOS COCK.
SCREWED.

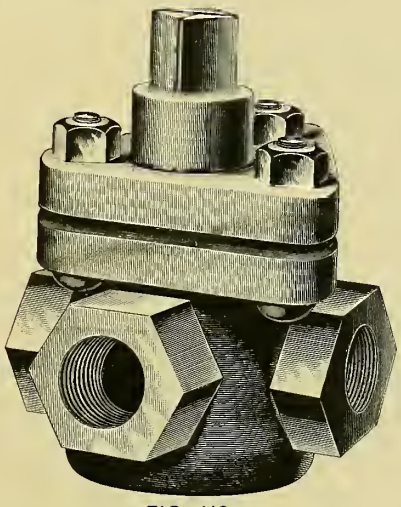


FIG. 419.
HYDRAULIC ASBESTOS COCK.
THREE-WAY.

Reducing Hydraulic Fittings to Order.

CLIMAX PATENTED HYDRAULIC VALVE.

Balanced and Full Opening.

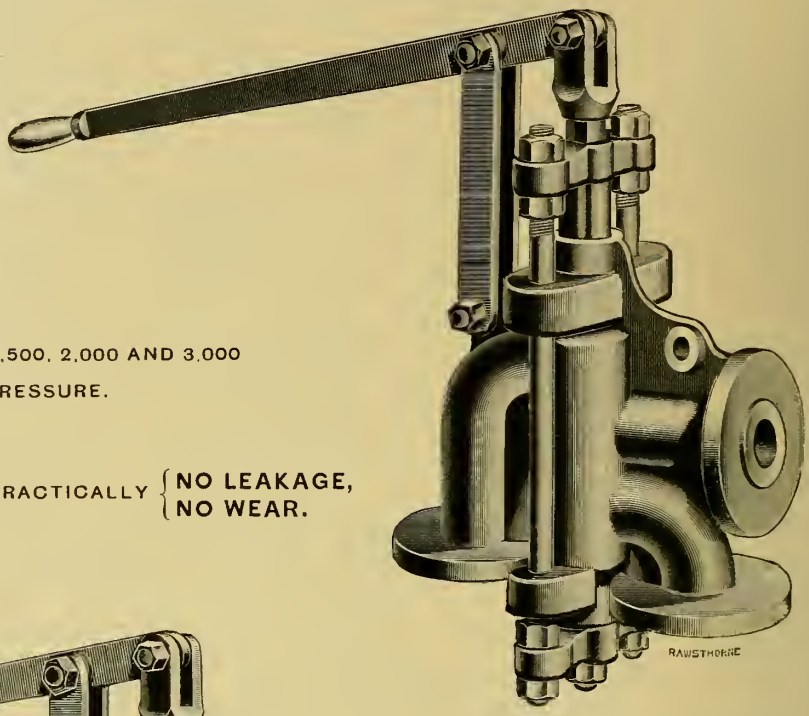


FIG. 420.
THREE WAY.

MADE FOR 500, 1,000, 1,500, 2,000 AND 3,000 POUNDS PRESSURE.

NO WASTE, NO EXPENSE, } AS THERE IS PRACTICALLY { NO LEAKAGE, NO WEAR.

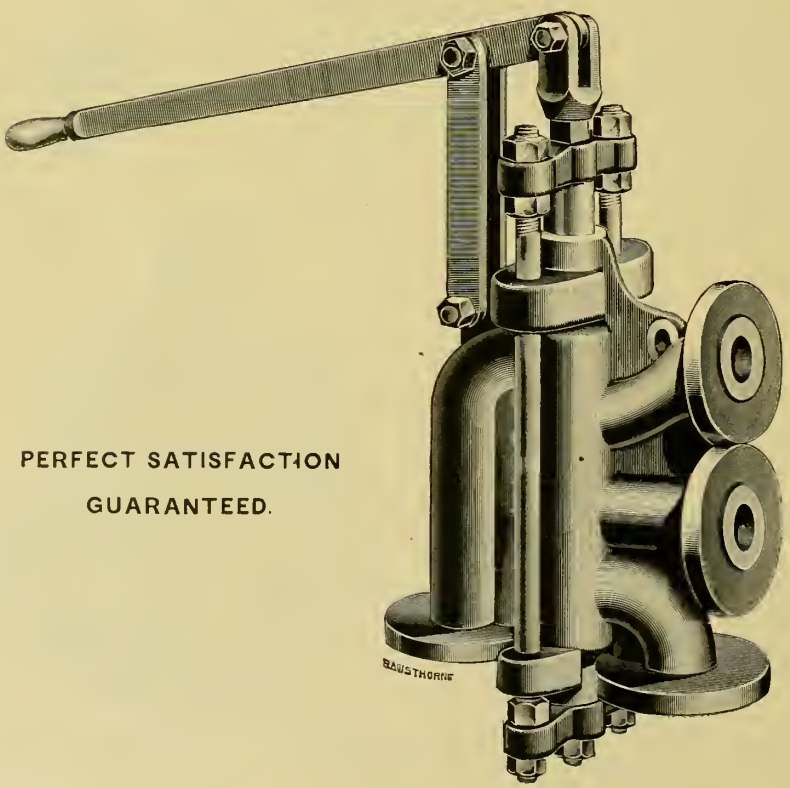


FIG. 421.
FOUR WAY.

PERFECT SATISFACTION GUARANTEED.

DETAIL DRAWINGS FURNISHED ON APPLICATION.

BRASS. # HYDRAULIC VALVES. IRON.

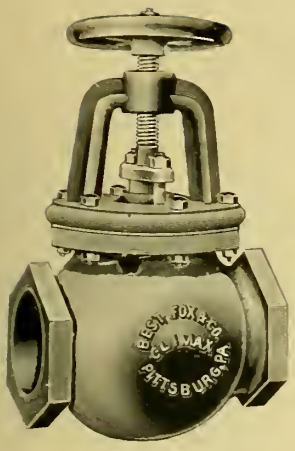


FIG. 422.
GLOBE.
SCREWED AND FLANGED.

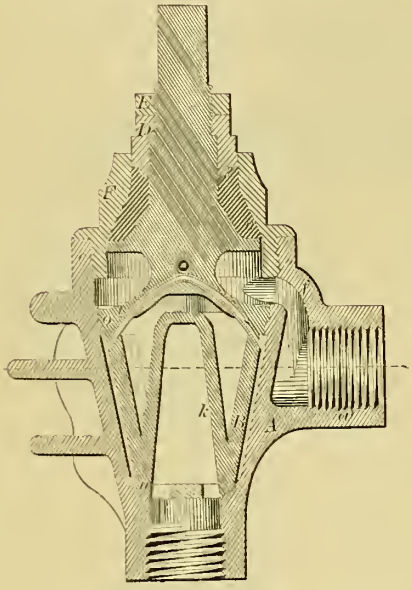


FIG 423.
GLENN'S HYDRAULIC BALANCE VALVE.
PATENTED.

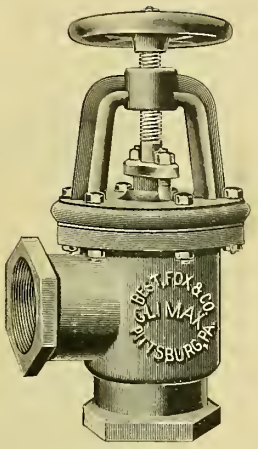


FIG. 424.
ANGLE.
SCREWED AND FLANGED.

Fig. 4.

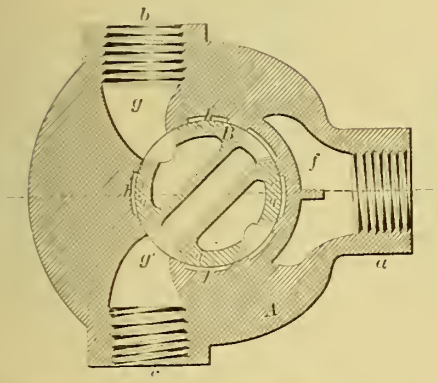


Fig.5

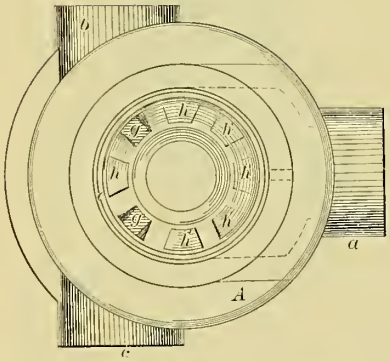
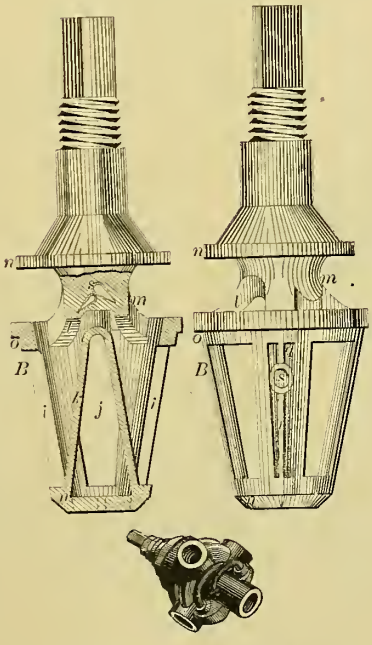


Fig.2 Fig.3



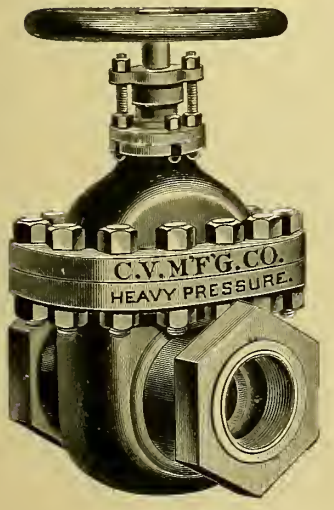


FIG 425.
GATE.
SCREWED.

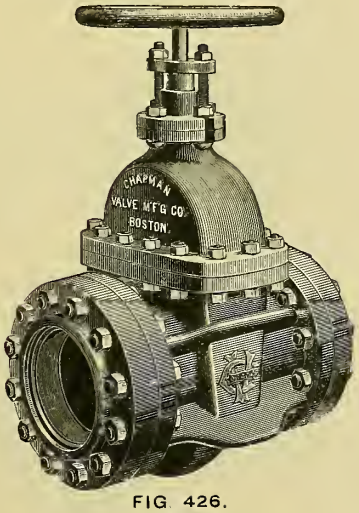


FIG. 426.
GATE.
FLANGED.

SPECIAL VALVES TO ORDER.

HYDRAULIC VALVES.

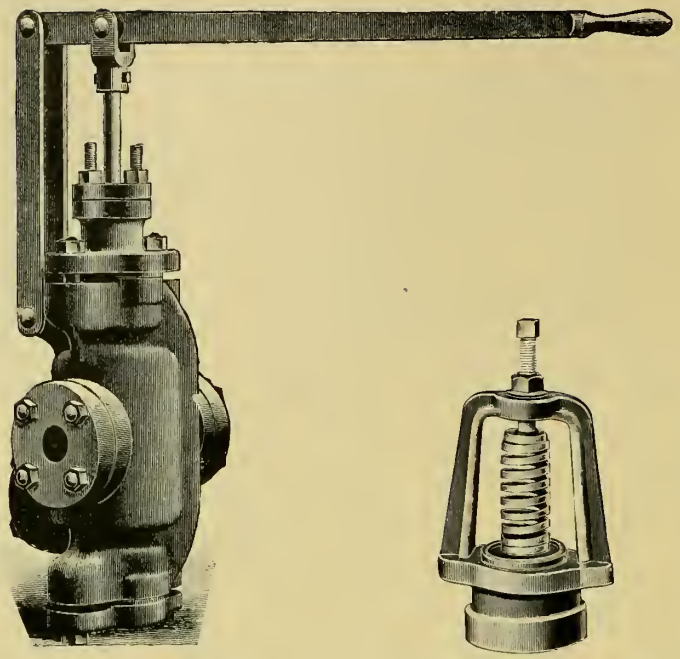


FIG. 427.
CRITCHLOW'S
HYDRAULIC VALVE.

FIG. 429.
RELIEF VALVE.

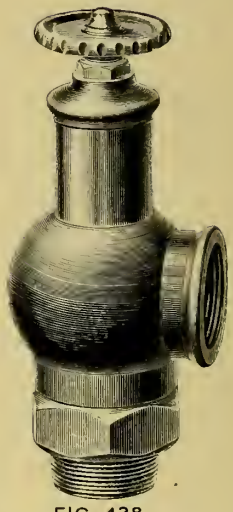


FIG. 428.
CROSBY.
WATER RELIEF VALVE.

PULPIT.

WITH CRITCHLOW VALVES, ANGLE STOP AND WASTE VALVES.

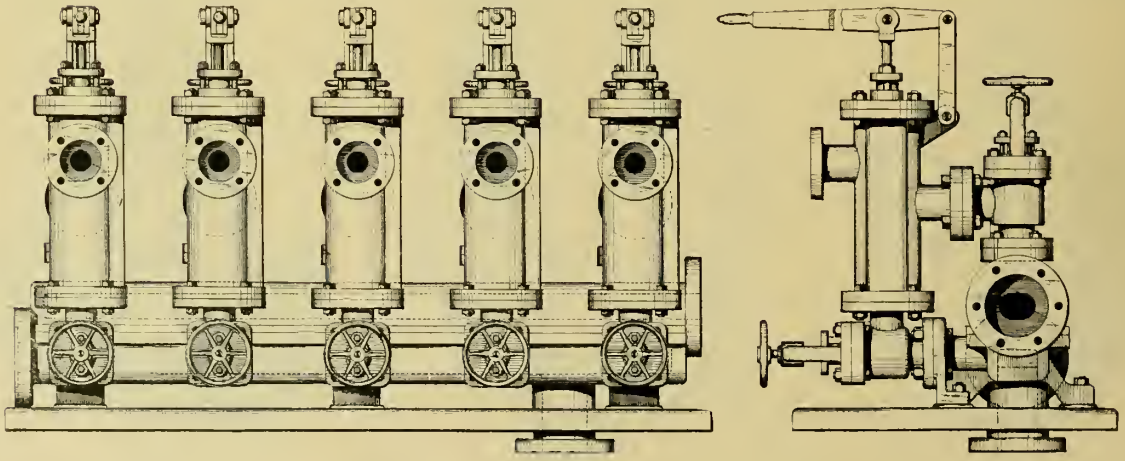


FIG. 430.

Detail Drawings on Application.

IRON CASE. # GAUGES. BRASS CASE.

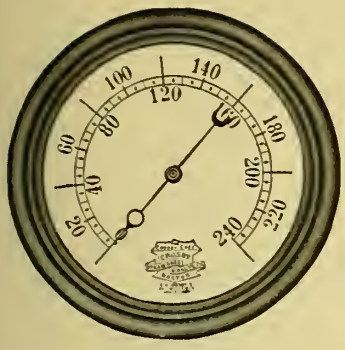


FIG. 431.
STEAM GAUGE.

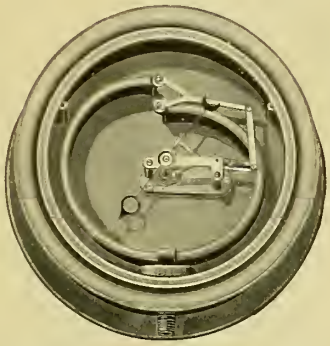


FIG. 432.
SECTION.

FIG. 433.
VACUUM GAUGE.

FIG. 434.
BLAST GAUGE.

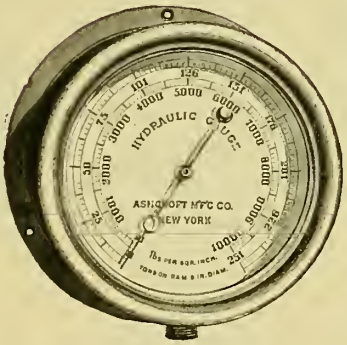


FIG. 435.
HYDRAULIC GAUGE.

FIG. 436.
AMMONIA GAUGE.

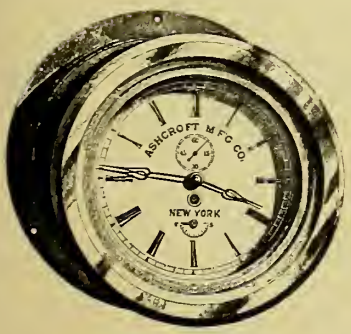


FIG. 437.
CLOCK.

FIG. 438.
REVOLUTION INDICATOR.
ROUND CASE.

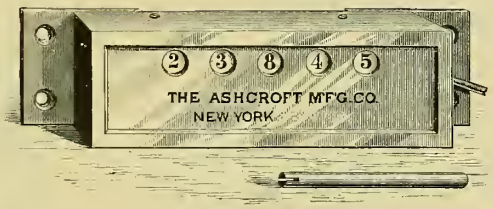


FIG. 439.
REVOLUTION INDICATOR.
SQUARE CASE.

FIG. 440.
SYPHON FOR STEAM GAUGES.

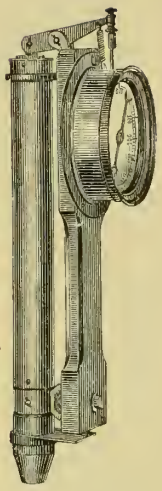


FIG. 441.

BROWN'S HOT BLAST PYROMETER.

PORTABLE.

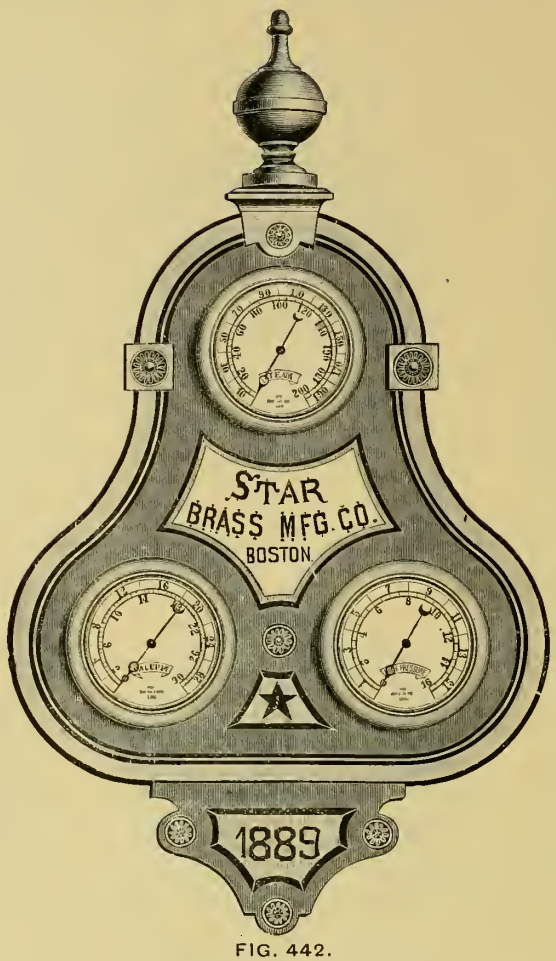


FIG. 442.

FRAME FOR GAUGES.

FIG. 443.

HOT BLAST PYROMETER.

STATIONARY.

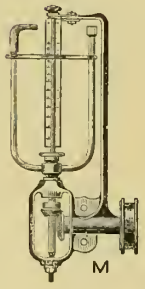


FIG. 444.

REVOLUTION INDICATOR.

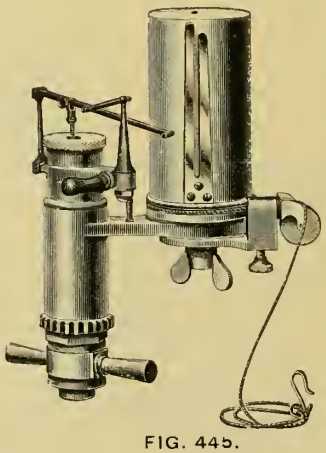


FIG. 445.

THOMPSON IMPROVED INDICATOR.

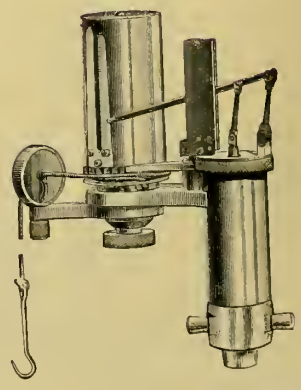


FIG 446.

TABOR IMPROVED INDICATOR.

Descriptive Circulars on application.

SHAW'S MERCURY GAUGES.

FIG. 447
WATER TANK INDICATOR.

FIG. 448.
STEAM GAUGE.
BRASS CASE.

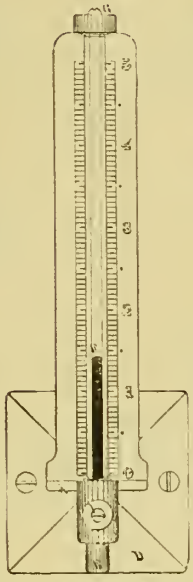


FIG. 449.
IRON GAUGE
FOR BLAST PRESSURE AND NATURAL GAS.

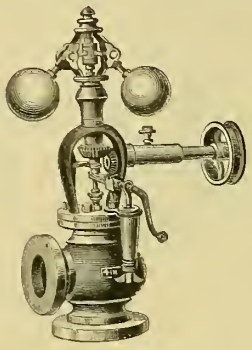


FIG. 450.
JUDSON GOVERNOR.
MEDIUM SPEED.

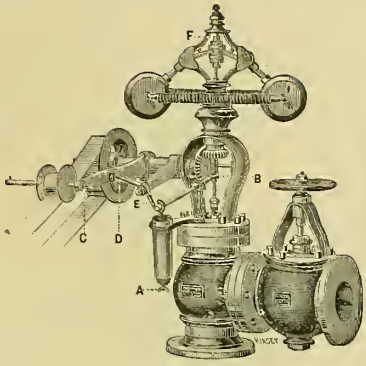


FIG. 451.
JUDSON GOVERNOR.
HIGH SPEED.

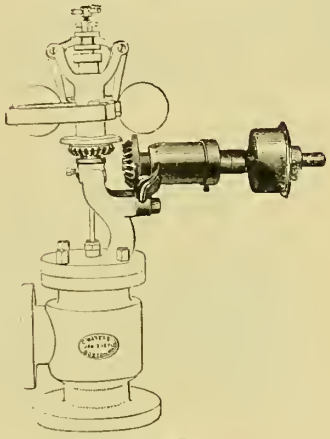


FIG. 452.
WATERS GOVERNOR.
AUTOMATIC—CLASS A.

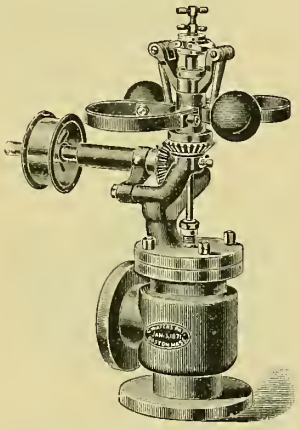


FIG. 453.
WATERS GOVERNOR.
CLASS B.

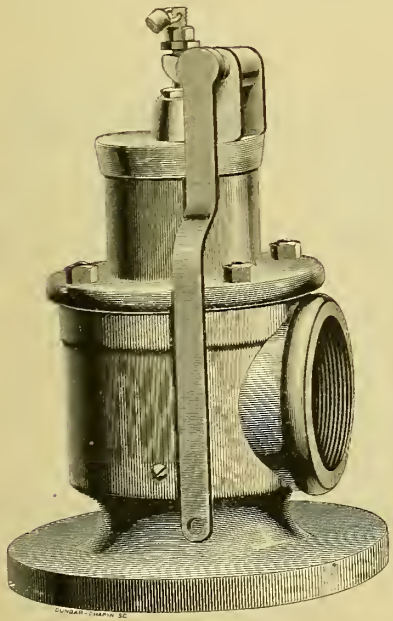


FIG. 454.
ASHTON POP SAFETY VALVE.

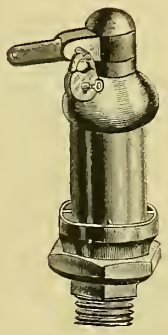


FIG. 455.
CROSBY POP SAFETY VALVE.
SCREWED AND FLANGED.

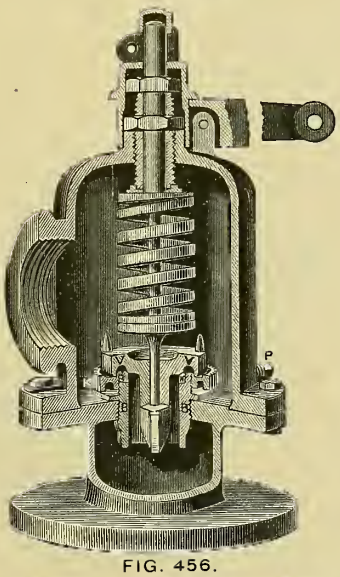


FIG. 456.
CONSOLIDATED POP SAFETY VALVE.
SCREWED AND FLANGED.

Governors or Pop Safety Valves of any Make Furnished.

REGULATORS.

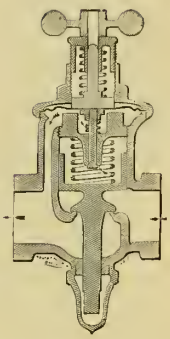


FIG. 457.
CURTIS'
FOR STEAM, WATER AND GAS.
SECTION.

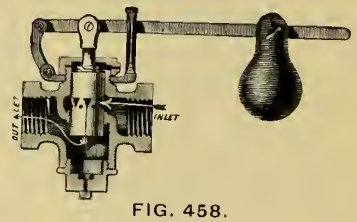


FIG. 458.
WATSON'S
FOR STEAM.

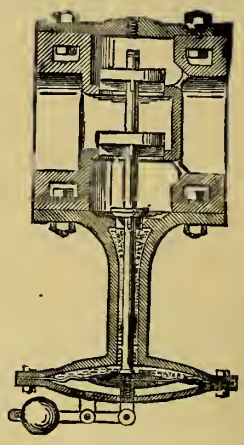


FIG. 459.
EUREKA.
FOR STEAM.

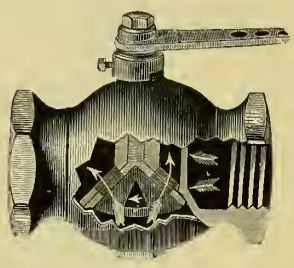


FIG. 460.
FITT'S CHRONOMETER AND REGULATOR VALVES.

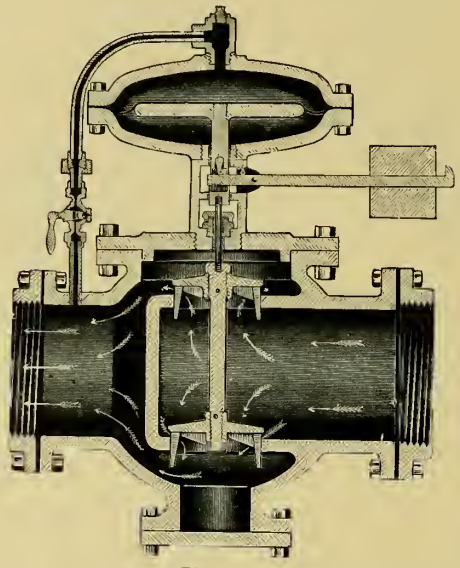


FIG. 461.
CHAPMAN'S
FOR NATURAL GAS.

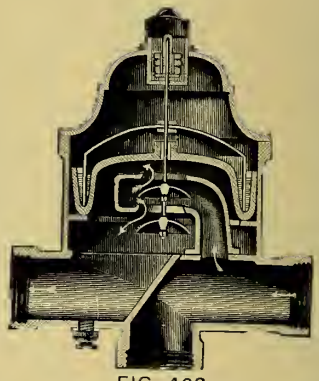


FIG. 462.
STOTT'S LOW PRESSURE
FOR ILLUMINATING AND NATURAL GAS

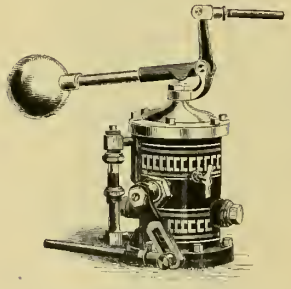


FIG 463.
PUMP GOVERNOR.
MASONS.

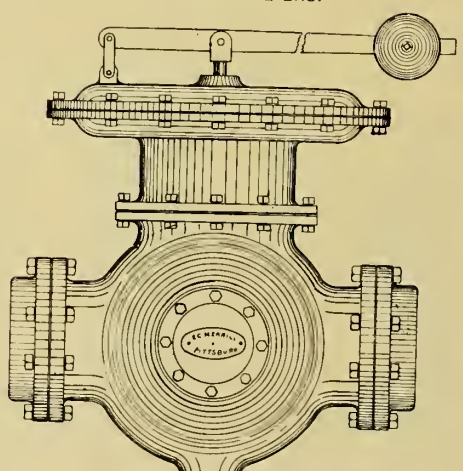


FIG 464.
MERRILL'S
FOR NATURAL GAS.

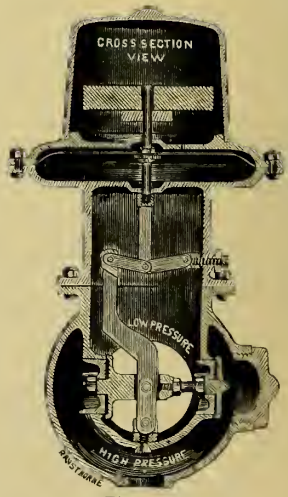


FIG. 465.
MERRILL'S
(SECTION.) FOR NATURAL GAS.

See also **Page 67.**

Descriptive Circulars on Application.

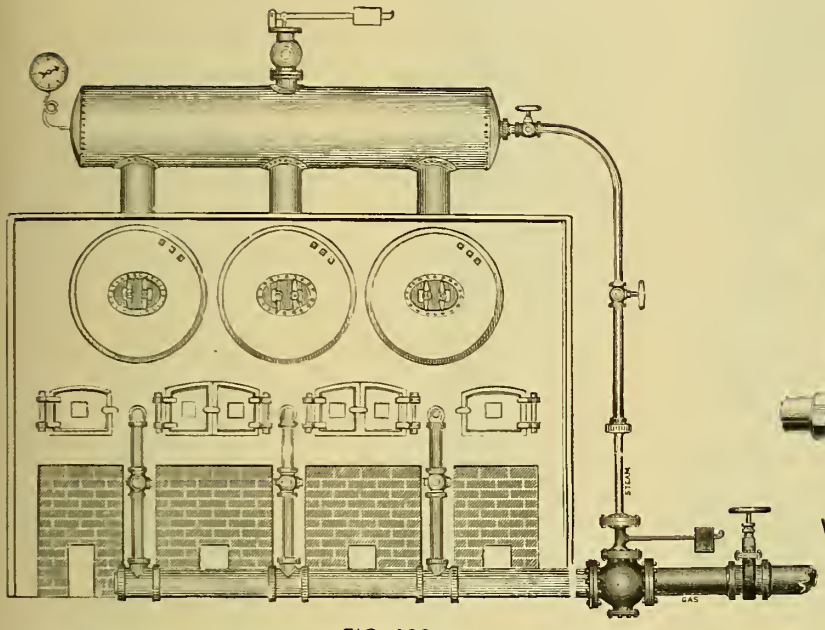


FIG. 466.
FULTON NATURAL GAS REGULATOR FOR STEAM BOILERS.
SHOWING BOILER REGULATOR AND CONNECTIONS.

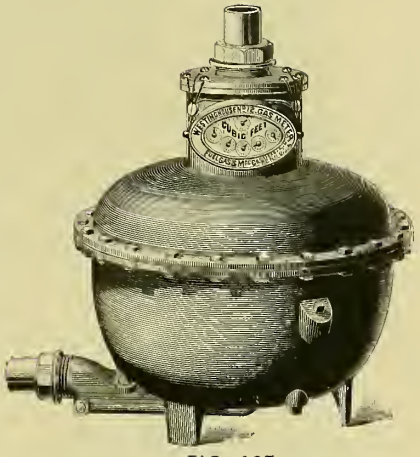


FIG. 467
WESTINGHOUSE GAS METER.

WATER METERS.

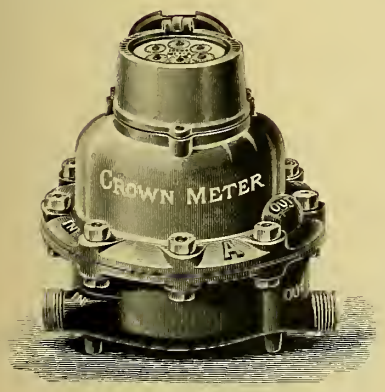


FIG. 468.
CROWN.

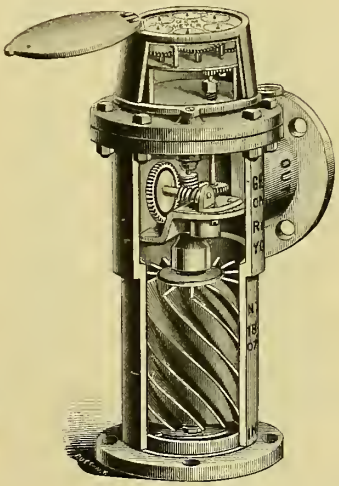


FIG. 469.
GEM.

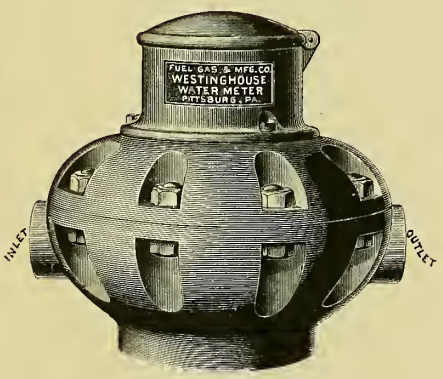


FIG. 470.
WESTINGHOUSE

Descriptive Circulars on Application.

NATIONAL WATER FILTER.

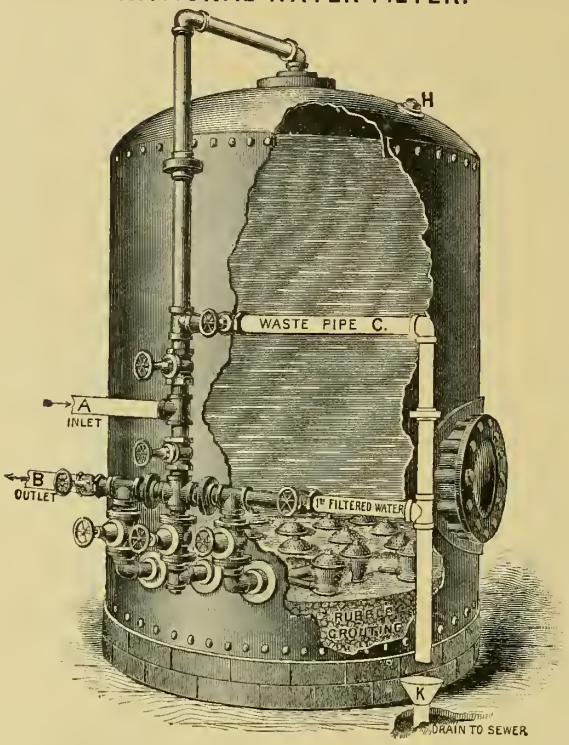


FIG. 471

EXHAUST STEAM INDUCTION CONDENSER.

MORGAN'S (EXTENSION) SHUT OFF BOXES.

FIG. 472.
FOR COCKS.

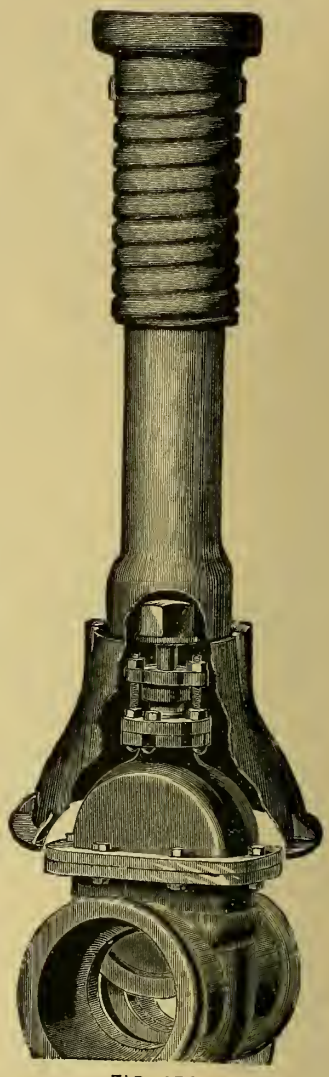


FIG 473.
FOR VALVES.

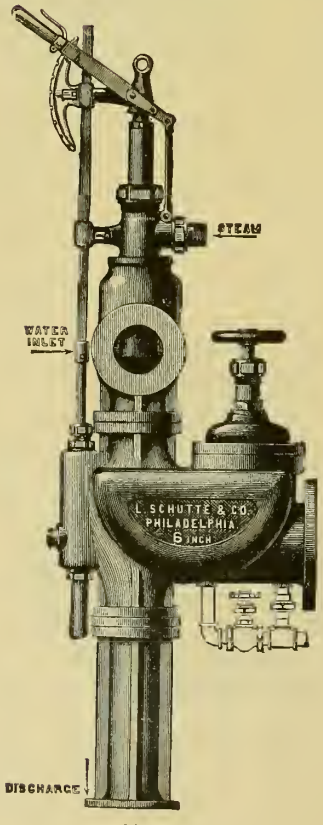


FIG. 474.
ADJUSTABLE.

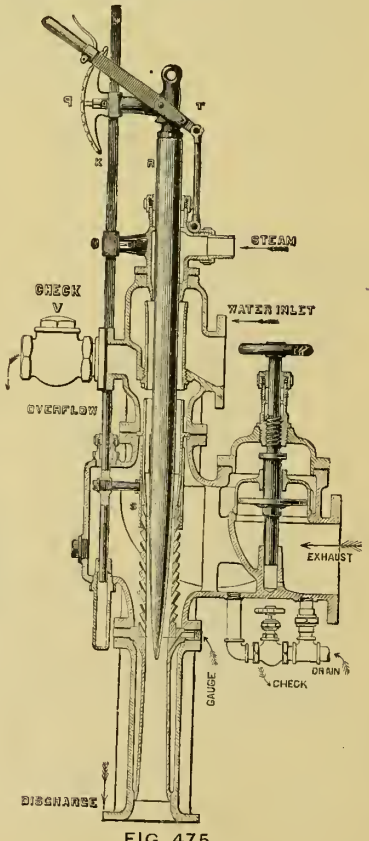


FIG. 475.
SECTION.

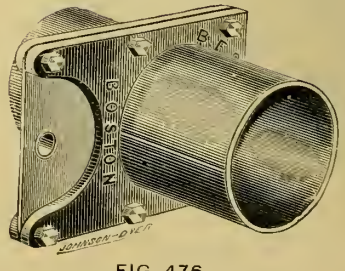


FIG 476
BLAST GATE.

Descriptive Circulars on Application.

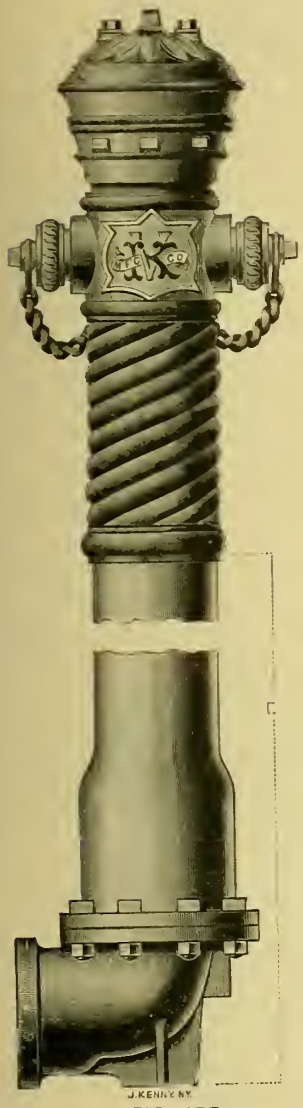


FIG. 477.
KENNEDY FIRE HYDRANT.
FROM 1 TO 4 OUTLETS.

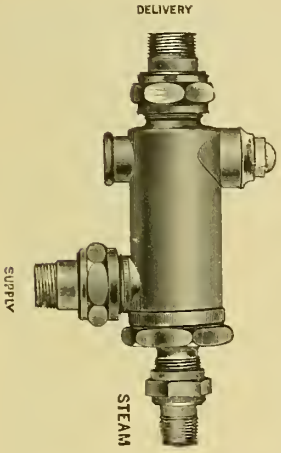


FIG. 479.
GARFIELD INJECTOR.

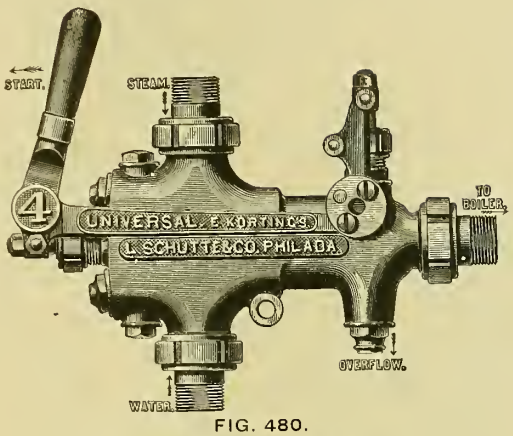


FIG. 480.
UNIVERSAL INJECTOR.
DOUBLE TUBE.

FIG. 478.
LEWIS HYDRANT

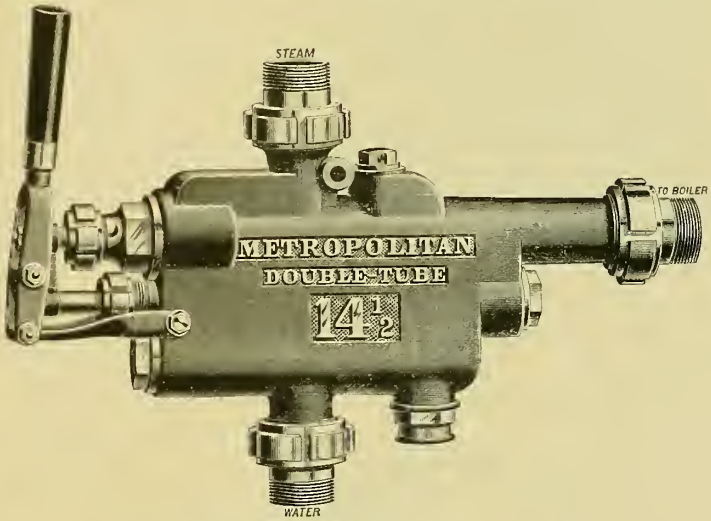


FIG. 481.
METROPOLITAN INJECTOR.
DOUBLE TUBE.

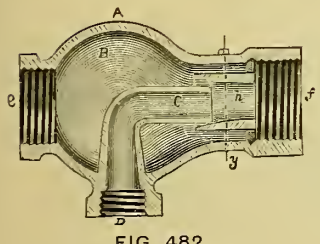


FIG. 482.
SYPHON PUMP.

FIG. 483.
DEFIANCE EJECTOR OR PUMP.

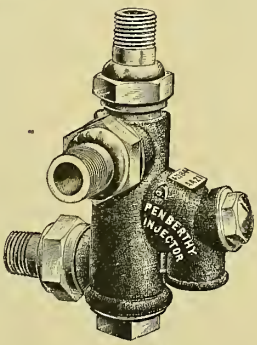


FIG. 484.
PENBERTHY INJECTOR.

Descriptive Circulars on application.

CLIMAX STEAM SEPARATORS.

SCREWED OR FLANGED. For Pipe from 2 in. to 12 in. Diameter.

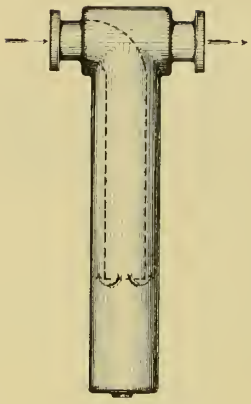


FIG 485.
FOR HORIZONTAL LINE.

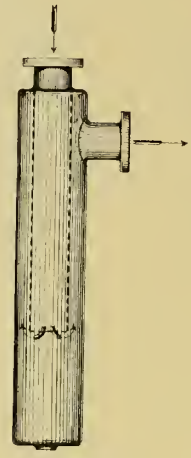


FIG 486.
FROM VERTICAL TO HORIZONTAL LINE.

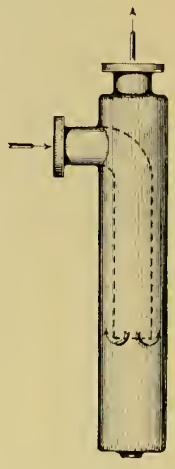


FIG 487
FROM HORIZONTAL TO VERTICAL LINE.

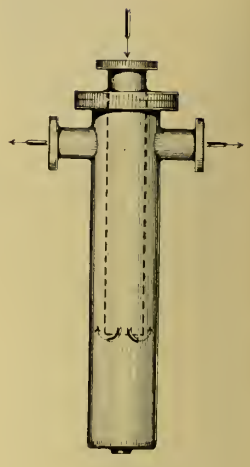


FIG. 488
THREE WAY FROM VERTICAL TO 2 HORIZONTAL LINES.

STEAM RECEIVERS.

ALL SIZES.

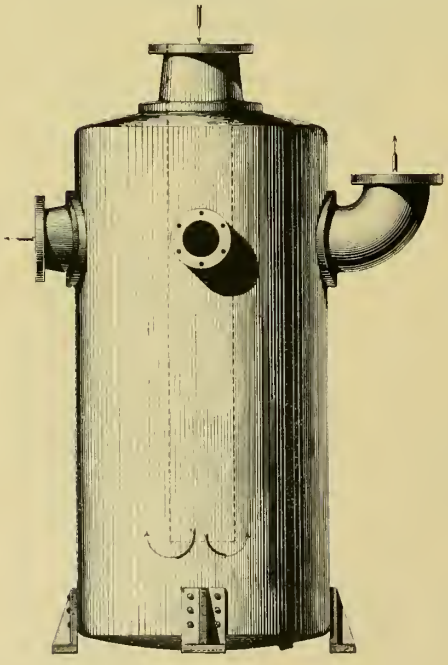


FIG. 489.

SPRAY HEATERS.

ALL SIZES.

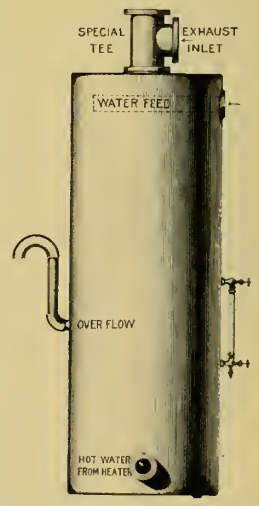


FIG. 490

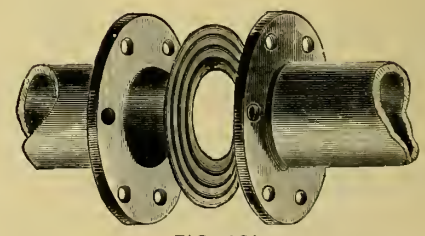


FIG. 491.
CORRUGATED COPPER GASKETS
OF ANY SIZE OR SHAPE.

FIG. 492.
STEAM SEPERATOR.
STRATTON'S.

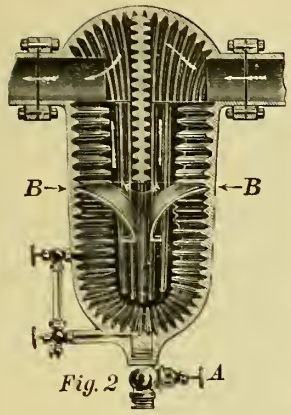


FIG 493.
STEAM SEPERATOR.
HINES'.

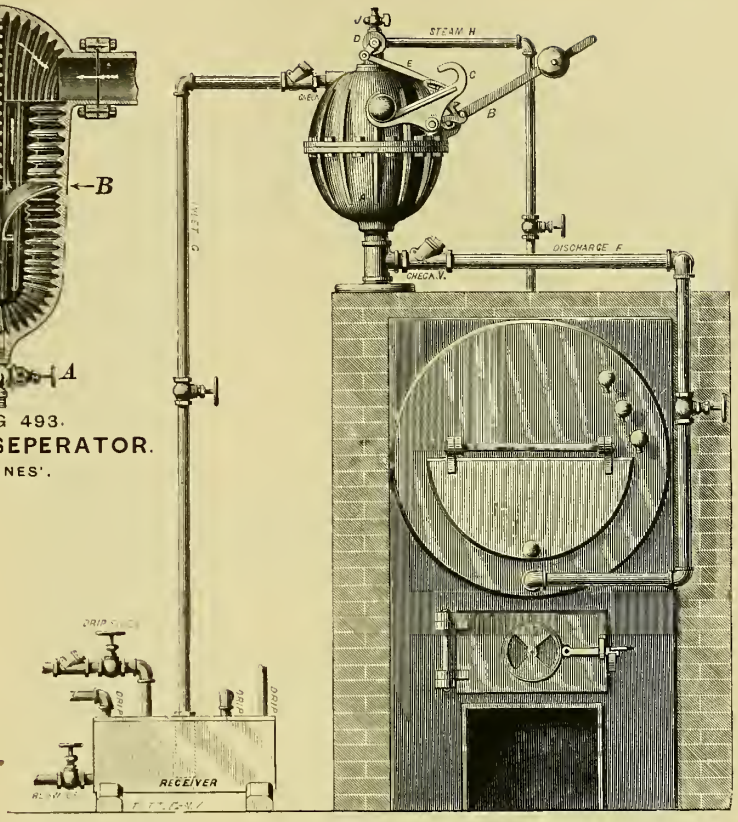


FIG. 494.
PRATT'S PAT. RETURN STEAM TRAP
FOR RETURNING WATER TO BOILER.

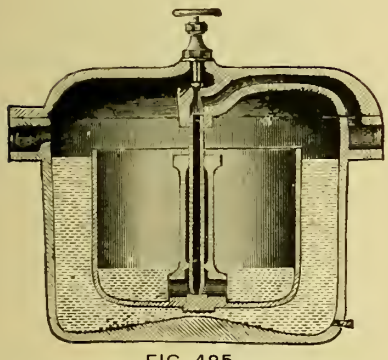


FIG. 495.
IMPROVED STEAM TRAP.
SECTION.

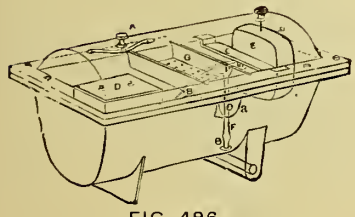


FIG. 496.
CHAPMAN STEAM TRAP
WITH SOAPSTONE FLOAT.

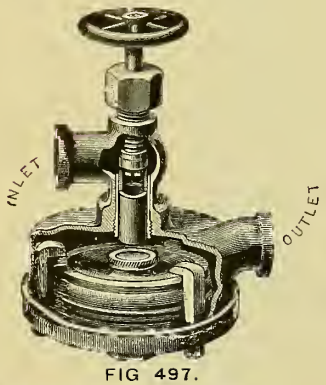


FIG 497.
STANDARD EXPANSION
STEAM TRAP.

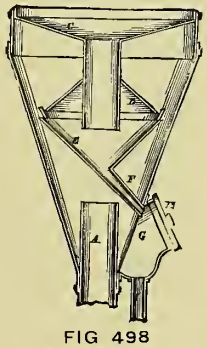


FIG 498
CONDENSER HEADS
FOR EXHAUST STEAM.
ANY MAKE.

Descriptive Circulars on Application.

FEED WATER HEATERS.

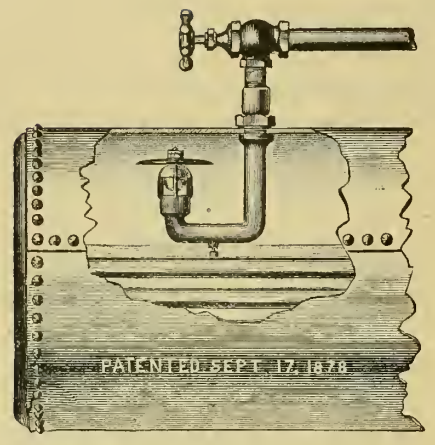


FIG. 499.
CHAMPION.
MOORE'S PATENT.

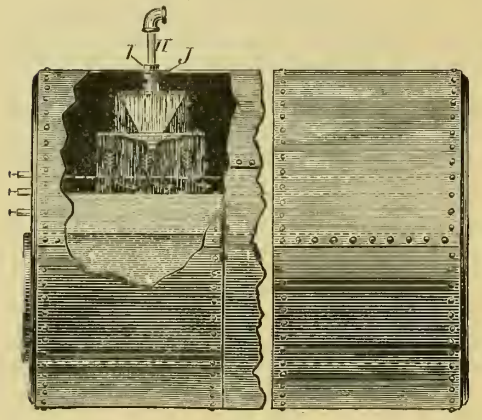


FIG 500.
FORD'S PATENT.

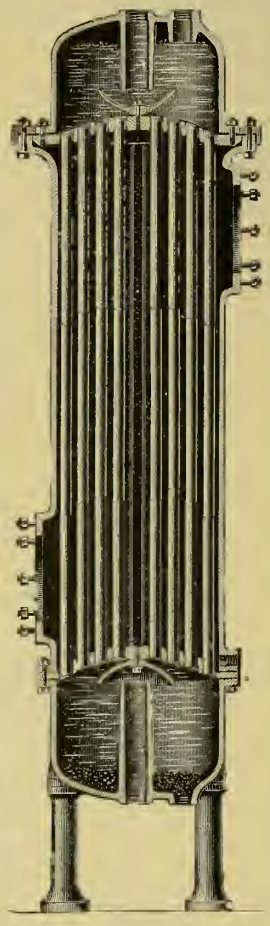


FIG. 501
GOUBERT HEATER.

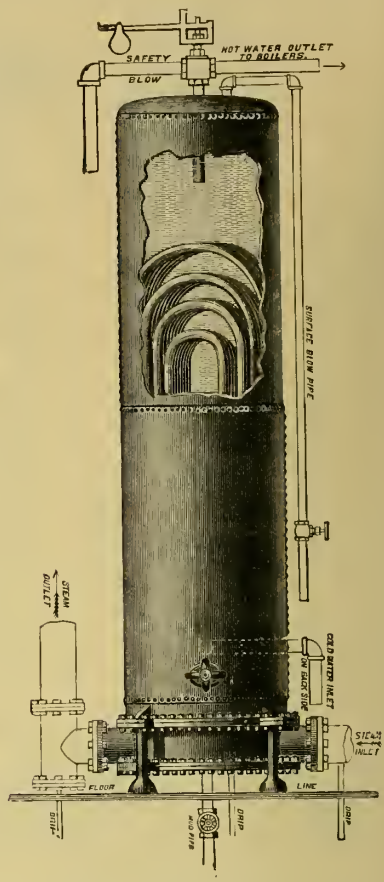
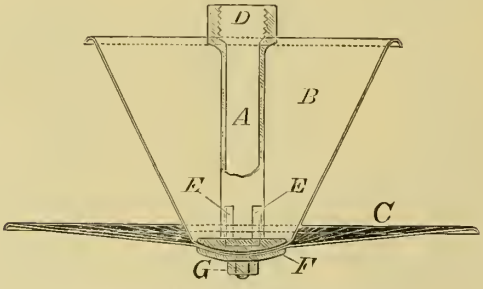


FIG. 502
BERRYMAN HEATER AND PURIFYER.



ENLARGED SECTION OF
FORD'S PATENT HEATER.

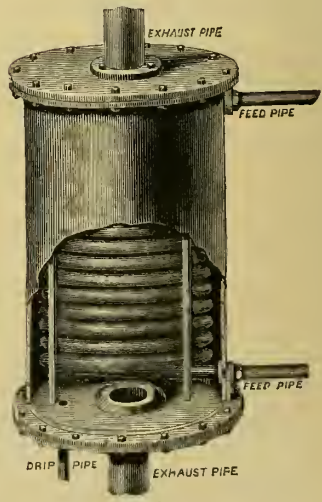


FIG. 503.
NATIONAL FEED WATER HEATER.

Descriptive Circulars on Application.

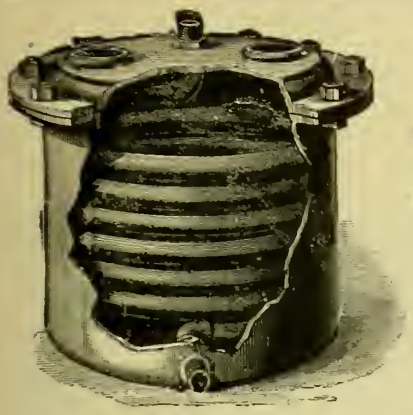


FIG. 504.
CAST IRON HEATER
WITH IRON PIPE COIL.

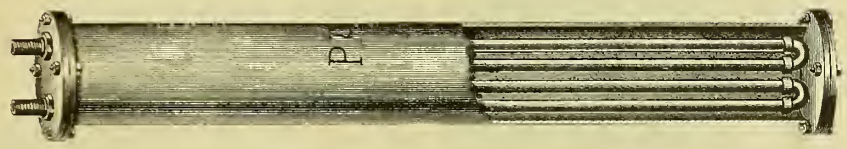


FIG. 505.
FEED WATER HEATER.
WITH RETURN BEND COIL.

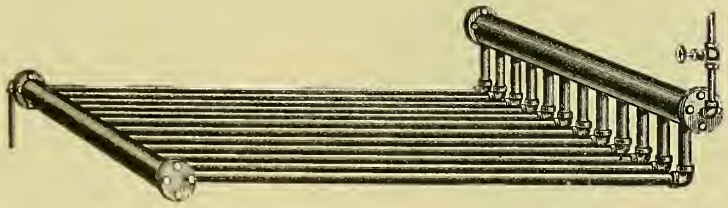


FIG. 506.
MANIFOLD HEATER
FOR DRYING LUMBER, ETC. (WROUGHT IRON HEADERS.)

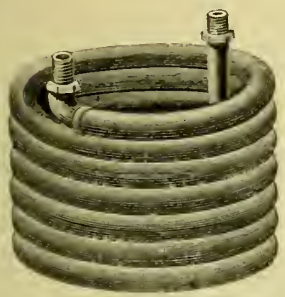


FIG. 507.
HEATER COILS.
IRON, BRASS OR COPPER PIPE.

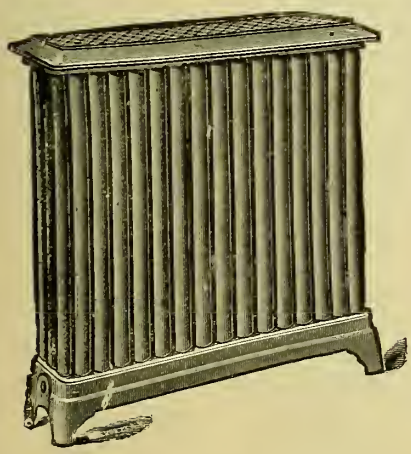


FIG. 508.
WROUGHT IRON TUBE RADIATOR.

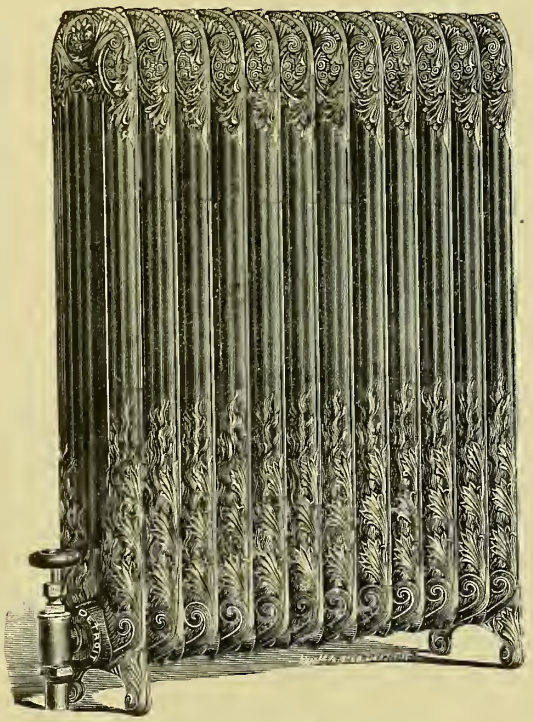


FIG. 509.
CAST IRON RADIATOR.
PERFECTION.

Descriptive Circulars on Application.

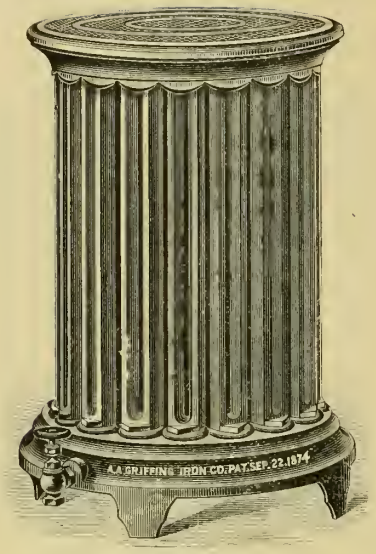


FIG. 510.
BUNDY CIRCULAR RADIATOR.

FIG. 511.
AUTOMATIC AIR VALVES.

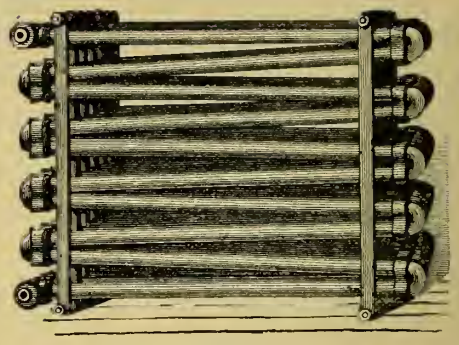
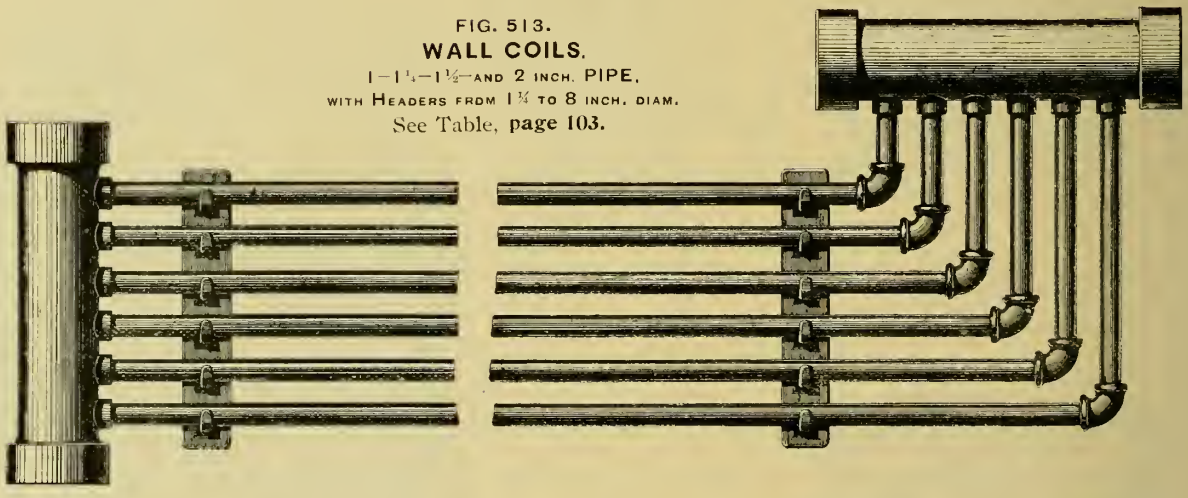


FIG. 512.
BOX COILS.

FIG. 513.
WALL COILS.
1—1¼—1½—AND 2 INCH. PIPE,
WITH HEADERS FROM 1¼ TO 8 INCH. DIAM.
See Table, page 103.



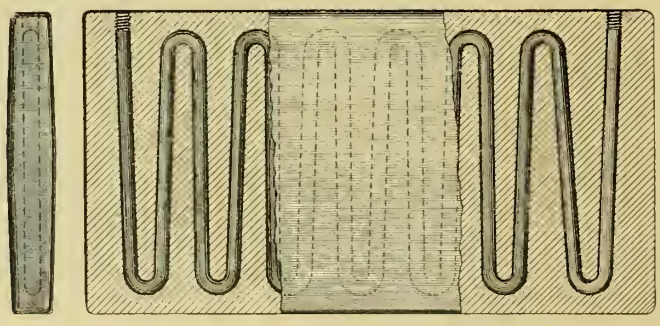


FIG. 514.
STEAM SUPER-HEATER.

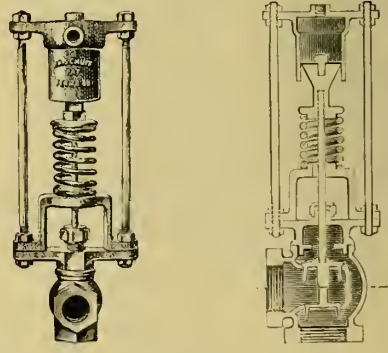


FIG. 515.
SCHUFFS' STEAM PRESSURE REGULATOR.

Descriptive Circulars on application.

LOCKE'S DAMPER REGULATORS.

AT LEAST 10 PER CENT. SAVING IN FUEL GUARANTEED.
NO STUFFING BOXES OR PACKING.
NO DIAPHRAGM.

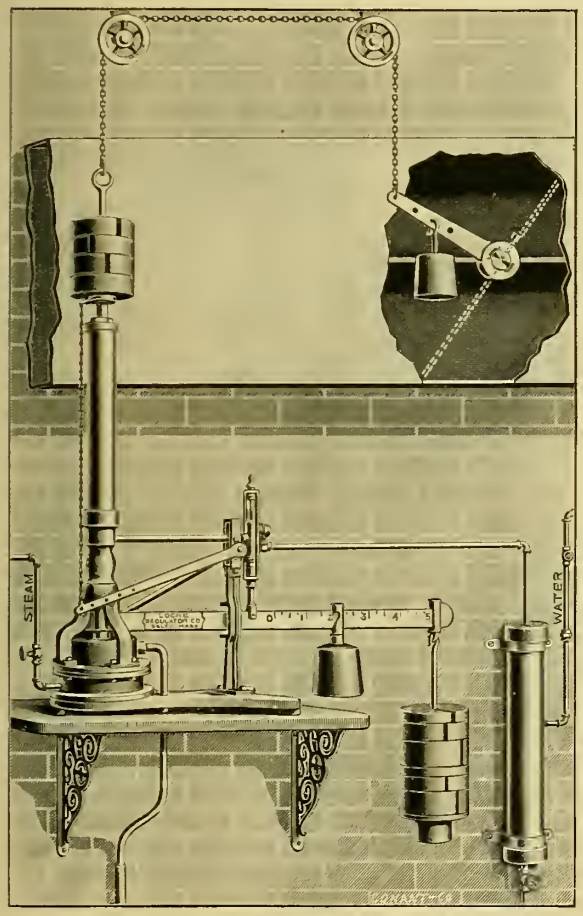


FIG. 516.

WARRANTED
TO OPERATE DAMPERS WITH VARIATION OF ⅛ LB.
STEAM PRESSURE. AND TO
FULLY CLOSE OR OPEN DAMPER WITH VARIATION OF 1 LB.
SOLD SUBJECT TO 30 DAYS TRIAL.
OVER 4000 OF LOCKE'S DAMPER REGULATORS IN USE.

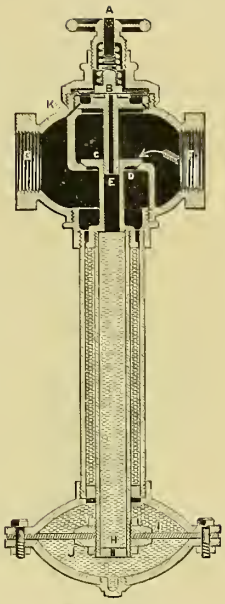


FIG. 517.

LOCKE'S (BEATS ALL)
PRESSURE REDUCING VALVE.

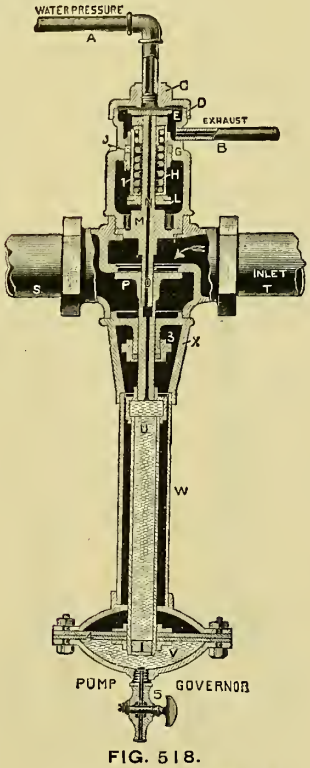


FIG. 518.

LOCKE'S (BEATS ALL)
PUMP GOVERNOR.

See also Page 58.

Descriptive Circular on application.

HEAVY IRON LAMPS. (Brazed)

FOR MILLS AND BLAST FURNACES.

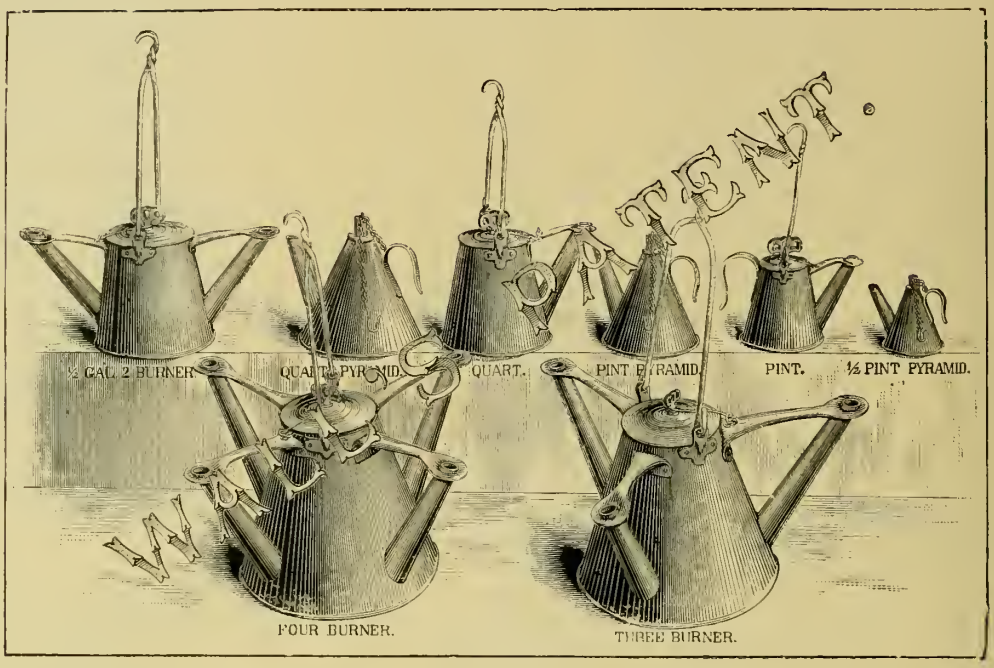


FIG. 519.

BLAKE'S PIPE HANGERS.

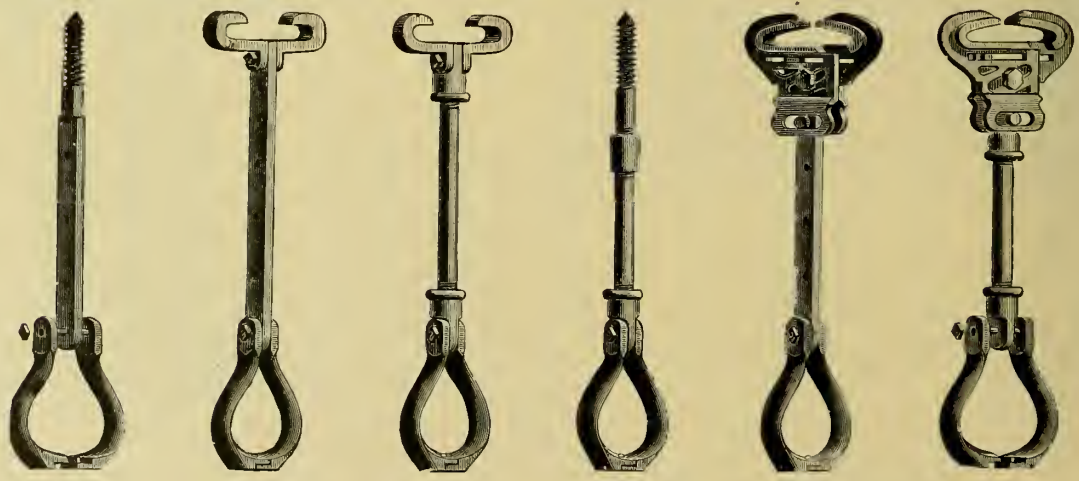


FIG 520. FIG. 521. FIG. 522. FIG. 523. FIG. 524. FIG. 525.

Descriptive Circular on Application.

FIG. 526.
PULLEY BLOCKS.
WESTON'S.

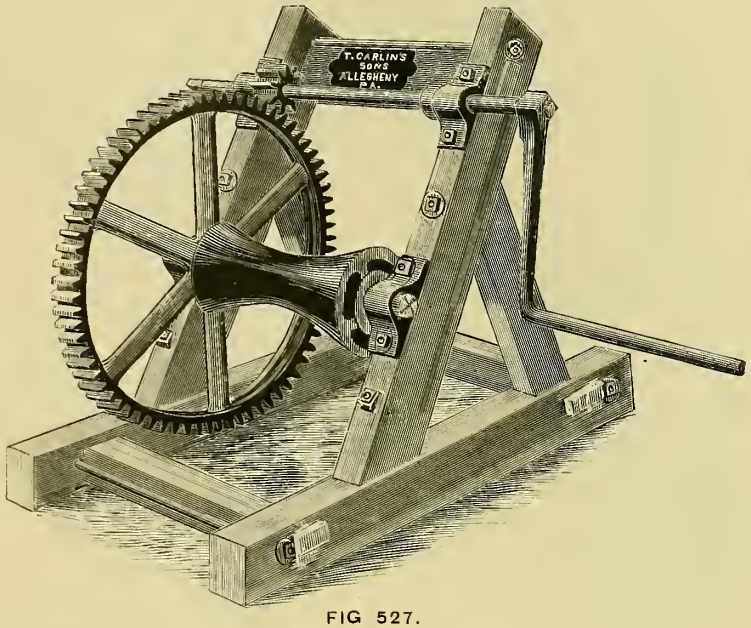


FIG 527.
WINDLASS OR CRAB.

TACKLE BLOCKS.

FIG. 528.
SINGLE.

FIG 529.
DOUBLE.

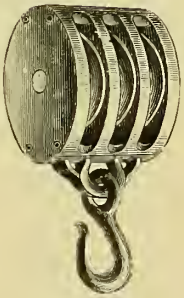
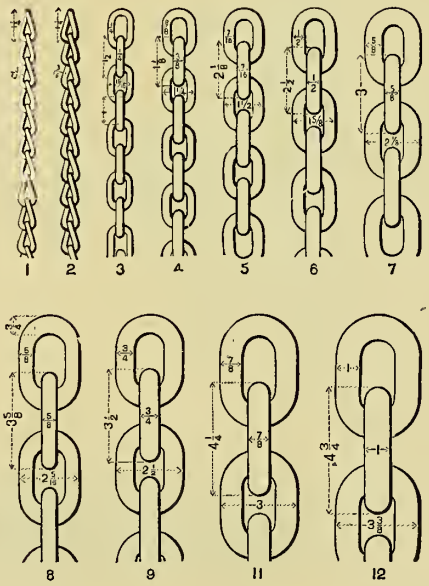


FIG. 530.
TRIPLE.

FIG. 531.
STEEL WIRE ROPE.
ALL SIZES.



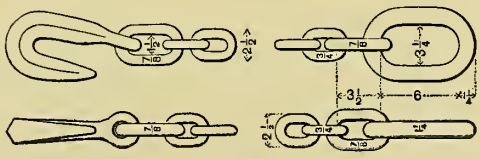


FIG. 532.
TESTED CHAIN.
ALL SIZES.

All Sizes—Wire, Manilla and Cotton Rope and Chain.

FIG. 533.
JACK SCREWS.

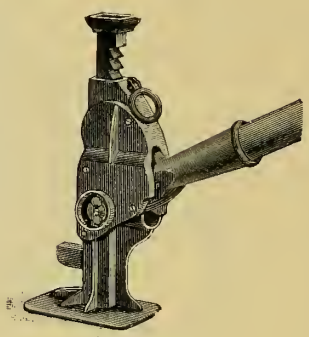


FIG. 534.
RATCHET JACK.

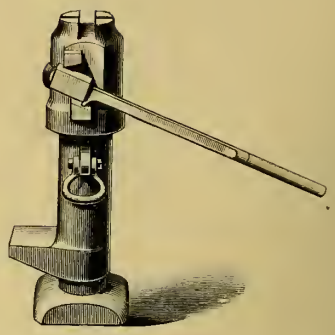


FIG. 535.
HYDRAULIC JACK.

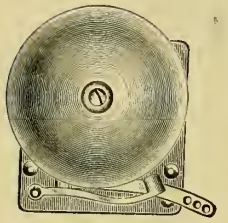


FIG 536.
TRIP GONG.
FROM 3 IN. TO 18 IN. DIAM.

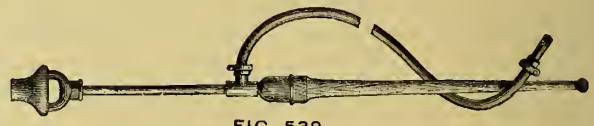


FIG. 539.
BOILER TUBE CLEANER.
CRIMMS' PATENT.

FIG. 537.
ROLLER TUBE EXPANDER.
HENDERER'S PATENT.

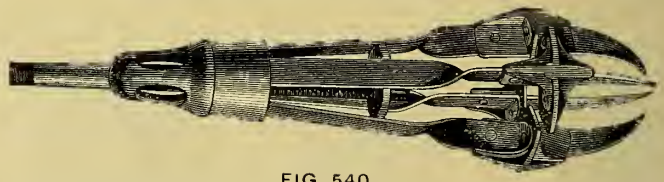


FIG. 540.
NATIONAL TUBE CLEANER.

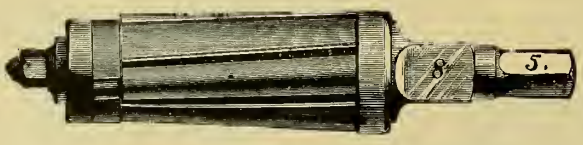


FIG. 538.
ROLLER TUBE EXPANDER.
COLLINS' PATENT.

FIG. 541.
STEEL WIRE FLUE BRUSH.

All Styles of Flue Cleaners.

SHAFTING—COLD ROLLED OR COLD DRAWN.

FROM 1-4 IN. TO 4 IN.

IRON. STEEL.

FIG. 542

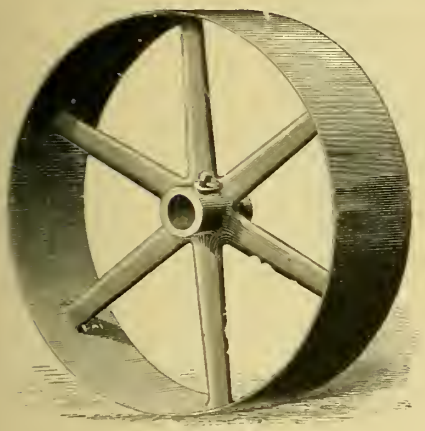


FIG. 543
PLAIN PULLEY.

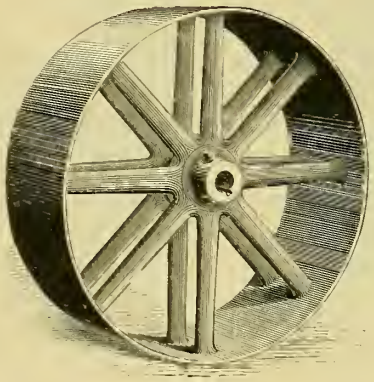


FIG. 544.
DOUBLE ARM PULLEY.

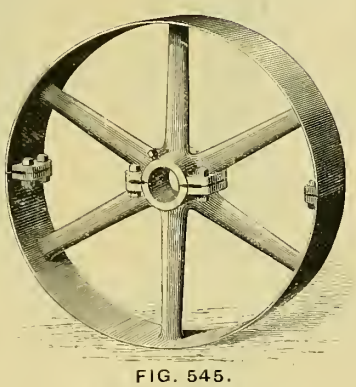


FIG. 545.
SPLIT PULLEY.

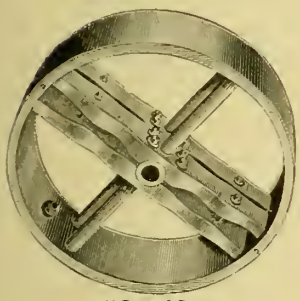


FIG. 546.
WOOD PULLEY.

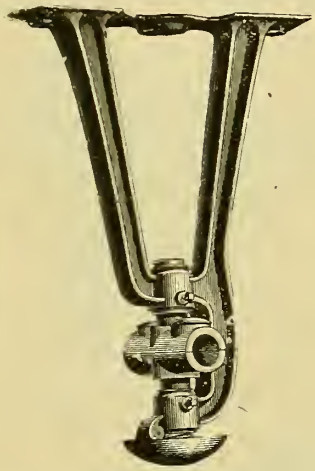


FIG. 547.
ADJUSTABLE HANGER.

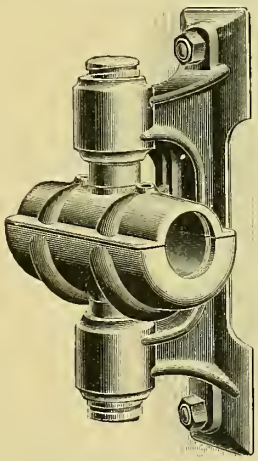


FIG. 548.
ADJST. POST HANGER.

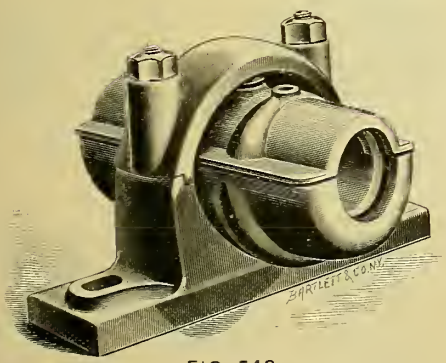


FIG. 549.
ADJST. PILLOW BLOCK.

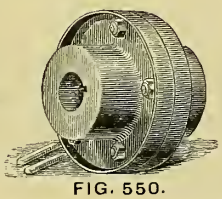


FIG. 550.
FLANGE COUPLINGS.

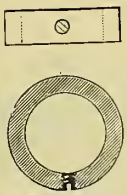


FIG. 551.
LOOSE COLLARS.

MACHINE BOLTS, NUTS, ETC.

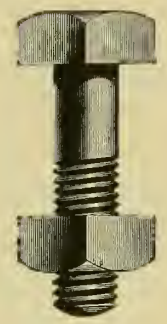


FIG. 552.
BOLT WITH SQUARE HEAD AND NUT.

FIG. 553.
BOLT WITH HEX. HEAD AND NUT.

FIG. 554.
BOLT WITH BUTTON HEAD, SQ. NECK.

FIG. 555
BOLT END.

FIG. 556.
WOOD OR LAG SCREW.

FIG. 557.
STUD BOLT.

FIG. 558
SET SCREW.
SQUARE HEAD.

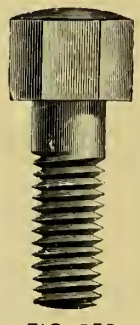


FIG. 559.
TAP BOLT.
HEX. HEAD.

FIG. 560.
UPSET OR ENLARGED BOLT ENDS.

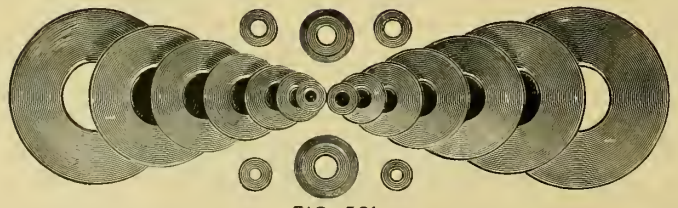


FIG. 561.
WASHERS
WROUGHT OR CAST IRON.

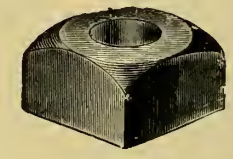


FIG. 563.
SQUARE NUT.

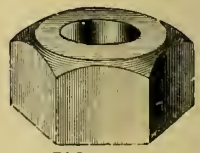


FIG. 564.
HEX. NUT

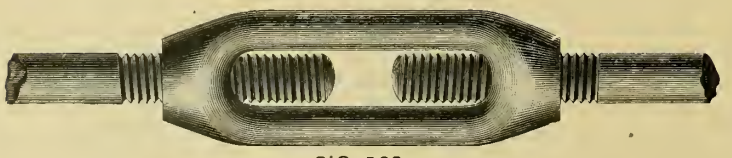


FIG. 562.
TURN BUCKLES.
DROP FORGED.

FIG. 565. FIG. 566. FIG 567.
BOILER AND TANK RIVETS.

TOOLS FOR CUTTING AND FITTING PIPE.

WALWORTH DIE PLATE OR STOCKS.

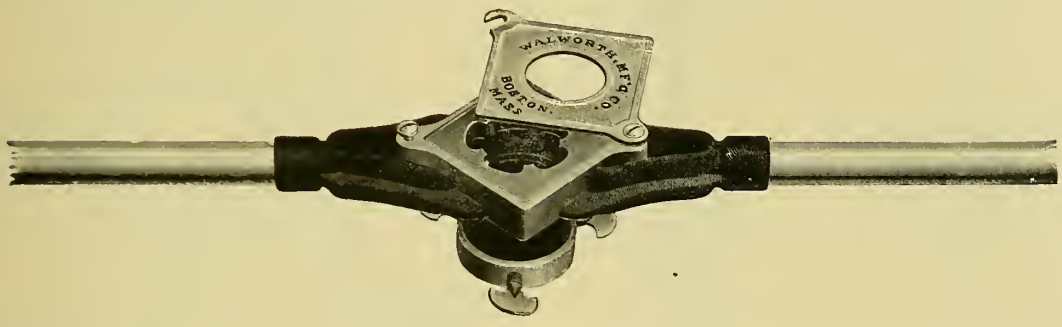


FIG. 568.

No. 1—Cuts from ¼ to 1 or . . . . . ⅛ to 1 inch.
No. 2—Cuts from 1¼ to 2 or . . . . . ¾ to 2 inch.

Separate Dies furnished when so ordered.

MILLER'S REVERSIBLE RATCHET DIE PLATE.

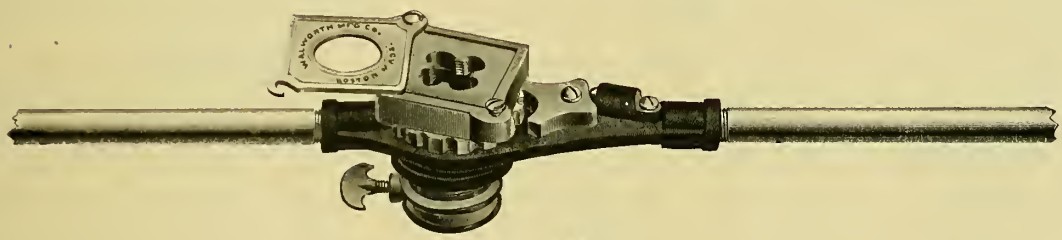


FIG. 569.

No. B—Cuts from . . . . . ¼ to 1 inch.
No. C—Cuts from . . . . . 1 to 1½ inch.
No. D—Cuts from . . . . . 1¼ to 2 inch.
No. E—Cuts from . . . . . 2½ to 3 inch.

ARMSTRONG'S ADJUSTABLE STOCK AND DIES.

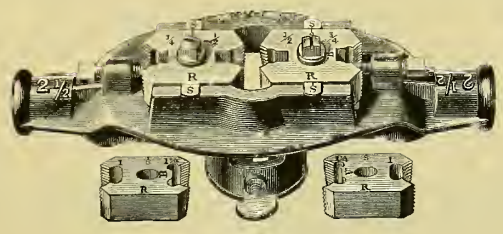


FIG. 570.

No. 1—Cuts from . . . . . ⅛ to ½ inch.
No. 2—Cuts from . . . . . ¼ to 1 inch.
No. 3—Cuts from . . . . . 1¼ to 2 inch.
No. 6—Cuts from . . . . . 2½ to 3 inch.
No. 7—Cuts from . . . . . 2½ to 4 inch.

FIG. 571.

DEAN STOCK AND DIES

Cuts from ⅛ in. to 1 in.

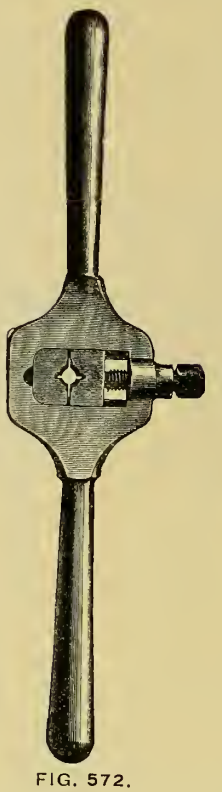


FIG. 572.

SCREW PLATE AND DIES FOR BOLTS.

No. A, Cuts from ¼ in. to ½ in.
No. B, Cuts from ⅜ in. to ¾ in.
No. C, Cuts from ½ in. to ⅞ in.
No. D, Cuts from ⅞ in. to 1¼ in.

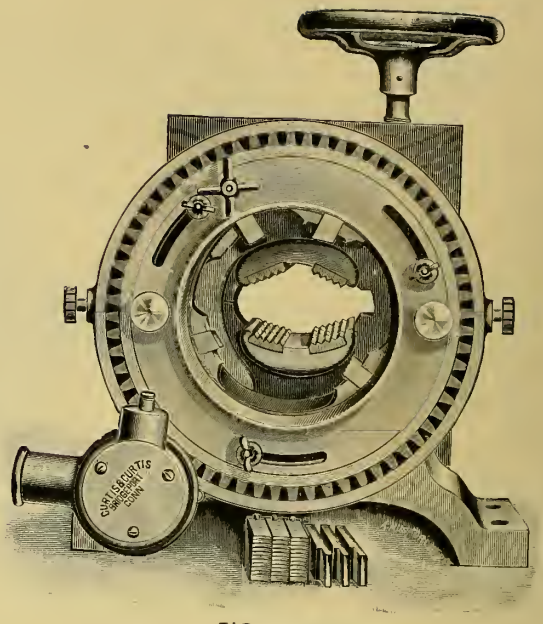


FIG. 573.

FORBE'S PATENT DIE STOCKS.

No. 1, Cuts from ¼ in. to 2 in.
No. 2, Cuts from 2½ in. to 4 in.
No. 3, Cuts from 4 in. to 6 in.

FIG. 574.

STANWOOD PIPE CUTTER.

No. 1, Cuts from ⅛ in. to 1 in.
No. 2, Cuts from ¾ in. to 2 in.
No. 3, Cuts from 2 in. to 3 in.

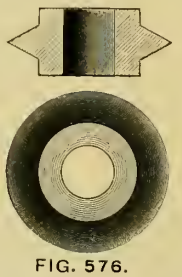


FIG. 576.

WHEELS FOR CUTTERS

ALL SIZES.

FIG. 577.

PINS FOR CUTTERS.

ALL SIZES.

FIG. 575.

BARNES 3 WHEEL PIPE CUTTER.

No. 1, Cuts from ⅛ in. to 1 in.
No. 2, Cuts from ½ in. to 2 in.
No. 3, Cuts from 1½ in. to 3 in.
No. 4, Cuts from 2½ in. to 4 in.
No. 5, Cuts from 4 in. to 6 in.
No. 6, Cuts from 6 in. to 8 in.
No. 7, Cuts from 9 in. to 12 in.

FIG. 578.

COMMON PIPE TONGS.

From $\frac{1}{8}$ in. to 8 in. pipe.

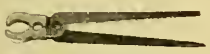


FIG. 580.

PLYERS.

From 8 in. to 14 in. long.

FIG. 579.

BROWN'S ADJST. TONGS.

No. 1,	takes from $\frac{1}{8}$ in.	to $\frac{3}{4}$ in.
No. $1\frac{1}{2}$,	takes from $\frac{3}{8}$ in.	to 1 in.
No. 2,	takes from $\frac{1}{2}$ in.	to $1\frac{1}{4}$ in.
No. 3,	takes from 1 in.	to 2 in.
No. 4,	takes from $1\frac{1}{2}$ in.	to 3 in.
No. 5,	takes from $2\frac{1}{2}$ in.	to 4 in.
No. 6,	takes from 3 in.	to 5 in.
No. 7,	takes from 4 in.	to 7 in.

FIG 581.

TRIMO PIPE WRENCH.

No. 6,	takes from $\frac{1}{8}$ in. wire	to $\frac{1}{2}$ in. pipe.
No. 8,	takes from $\frac{1}{8}$ in. wire	to $\frac{3}{4}$ in. pipe.
No. 10,	takes from $\frac{1}{8}$ in. wire	to 1 in. pipe.
No. 14,	takes from $\frac{1}{4}$ in. wire	to $1\frac{1}{2}$ in. pipe.
No. 18,	takes from $\frac{1}{4}$ in. wire	to 2 in. pipe.
No. 24,	takes from $\frac{1}{4}$ in. wire	to $2\frac{1}{2}$ in. pipe.
No. 36,	takes from $\frac{1}{2}$ in. wire	to $3\frac{1}{2}$ in. pipe.
No. 42,	takes from 1 in. pipe	to 5 in. pipe.

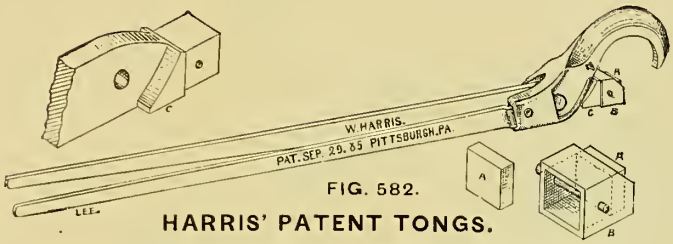


FIG. 582.

HARRIS' PATENT TONGS.

One Tong required for each size of pipe. Steel Handles, Malleable Head, Adjustable Bit, with eight sharp edges.

FIC 583.

ROBBIN'S CHAIN TONGS.

No. 2,	takes from 1 in.	to 2 in. pipe.
No. 3,	takes from $1\frac{1}{2}$ in.	to 4 in. pipe.
No. 4,	takes from 2 in.	to 6 in. pipe.
No. 5,	takes from $2\frac{1}{2}$ in.	to 8 in. pipe.
No. 6,	takes from 4 in	to 10 in. pipe.
No. 7,	takes from 4 in.	to 16 in. pipe.

FIG. 584.

BROCK'S PAT. CHAIN TONGS.

No. 0,	takes from $\frac{3}{8}$ in.	to $\frac{3}{4}$ in. pipe.
No. 1,	takes from $\frac{1}{8}$ in.	to $1\frac{1}{2}$ in. pipe.
No. 2,	takes from $\frac{1}{4}$ in.	to $2\frac{1}{2}$ in. pipe.
No. 3,	takes from $\frac{3}{4}$ in.	to 4 in. pipe.
No. 4,	takes from 1 in.	to 8 in. pipe.
No. 5,	takes from 2 in.	to 14 in. pipe.

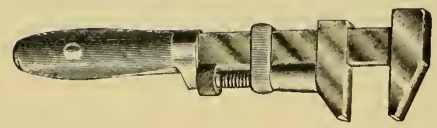


FIG. 585.
MONKEY WRENCH.
FROM 6 IN. TO 21 IN. LONG.

FIG. 586.
BAXTER S WRENCH.
FROM 4 IN. TO 15 IN. LONG.

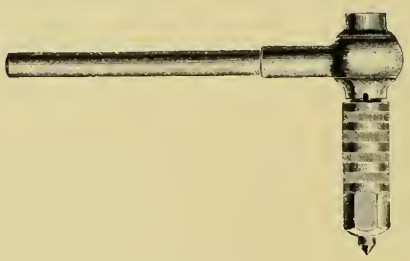


FIG. 587.
SMITH'S FRICTION SLEEVE RATCHET.
FROM 10 IN. TO 20 IN. LONG.

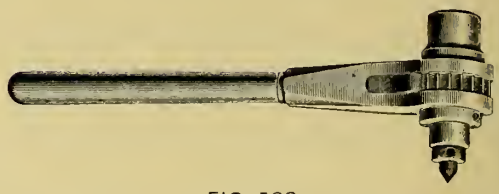


FIG. 588.
PACKER BOILER RATCHET.
FROM 10 IN. TO 20 IN. LONG.

FIG. 589.
PIPE TAP.

FIG. 590.
PIPE REAMER.

FIG. 591.
COMBINED TAP, REAMER AND DRILL.

FIG. 592.
PIPE DRILL.

FIG. 593.
TWIST DRILL.

FIG. 594.
COUNTERBORE DRILL.

FIG. 595.
TAPER.

FIG. 596.
PLUG.

FIG. 597.
BOTTOMING.

MACHINISTS' TAPS.

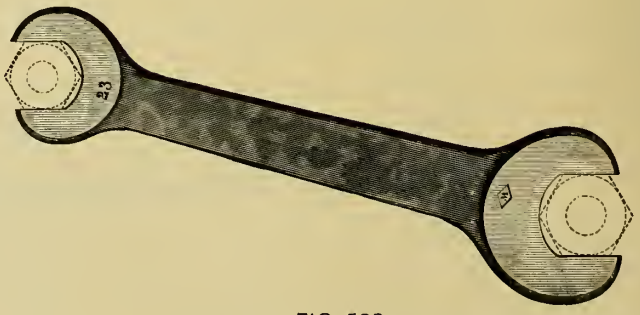


FIG. 598.
WRENCH, DROP FORGED.
(ALL SIZES AND STYLES.)

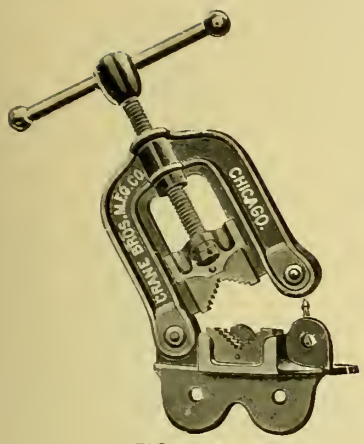


FIG. 599.
PIPE VISE.
MALLEABLE.

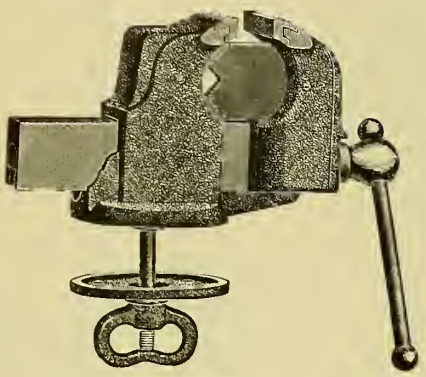


FIG. 600.
COMBINATION VISE.
SMITH'S.

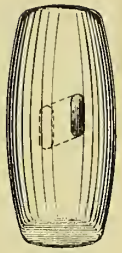


FIG. 601. FIG. 602.
HAMMERS AND SLEDGES.
MACHINISTS. COPPER.

FIG. 603.
GLASS TUBE CUTTER.

FIG. 604.
COPPER FLOATS.
HEAVY FOR BOILER PRESSURE.
LIGHT FOR TANK PRESSURE.

FIG. 604½.
TANK VALVES.

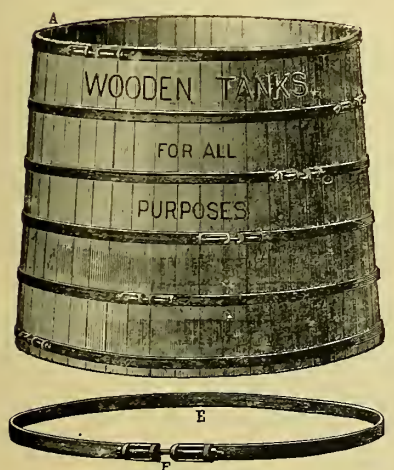


FIG. 605.
WOODEN TANKS.
ANY CAPACITY.

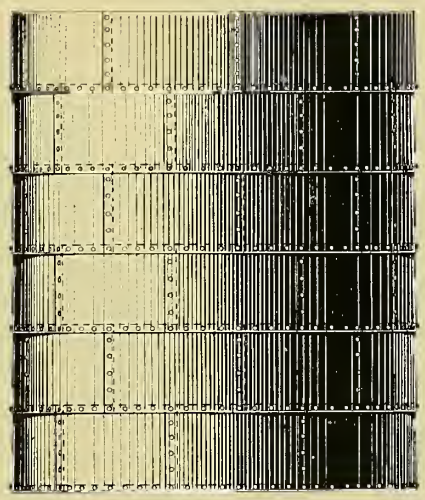


FIG. 606.
IRON TANKS.
ANY CAPACITY.

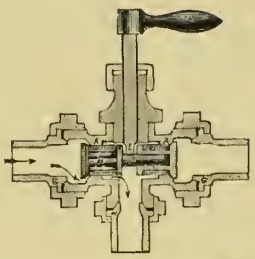


FIG. 607.

LUNKENHEIMER'S AUTOMATIC CYLINDER COCK.

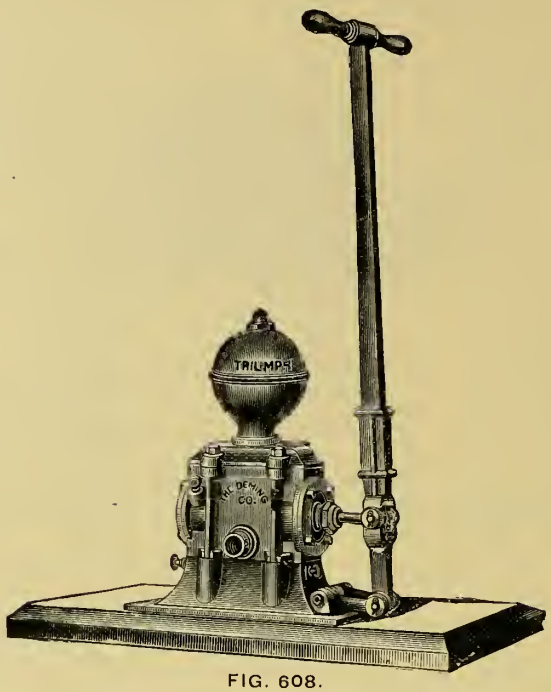


FIG. 608.

TRIUMPH DOUBLE ACTING FORCE PUMP.

SINGLE LEVER.

ALSO MADE WITH DOUBLE LEVER.

Hand pumps furnished of any style.

FIG. 609.

WORKING BARREL.

FOR DEEP WELLS.

From 2 in. to 6 in. in diameter.

FIG. 610.

CLIMAX OIL BURNER.

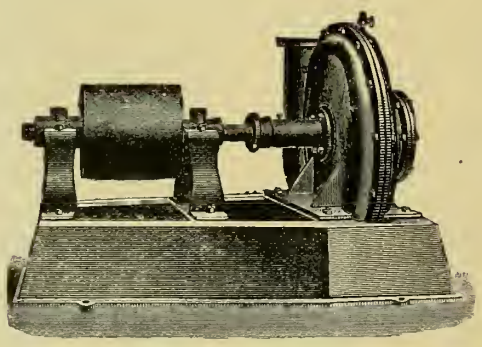


FIG. 611.

HORIZONTAL CENTRIFUGAL PUMP.

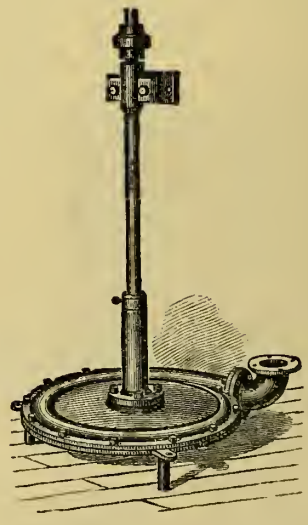


FIG. 612.

VERTICAL CENTRIFUGAL PUMP.

Descriptive circular on application.

BUFFALO DUPLEX STEAM PUMPS.

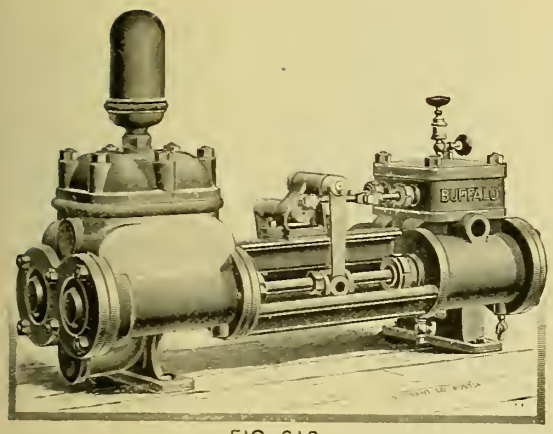


FIG. 613.
BOILER FEED PUMP.
REGULAR PATTERN.

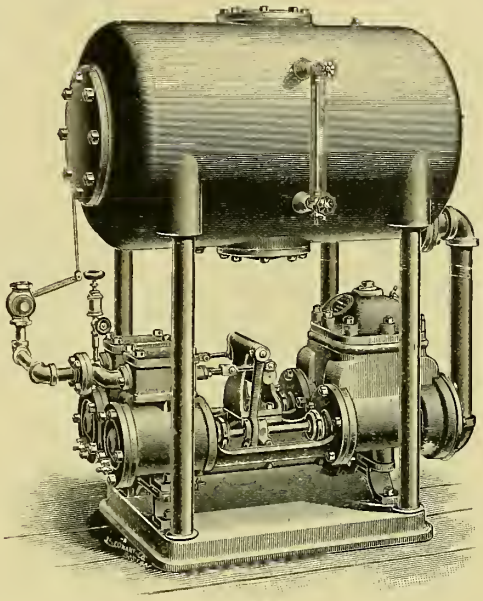


FIG. 614.
AUTOMATIC FEED PUMP
WITH RECEIVING TANK.

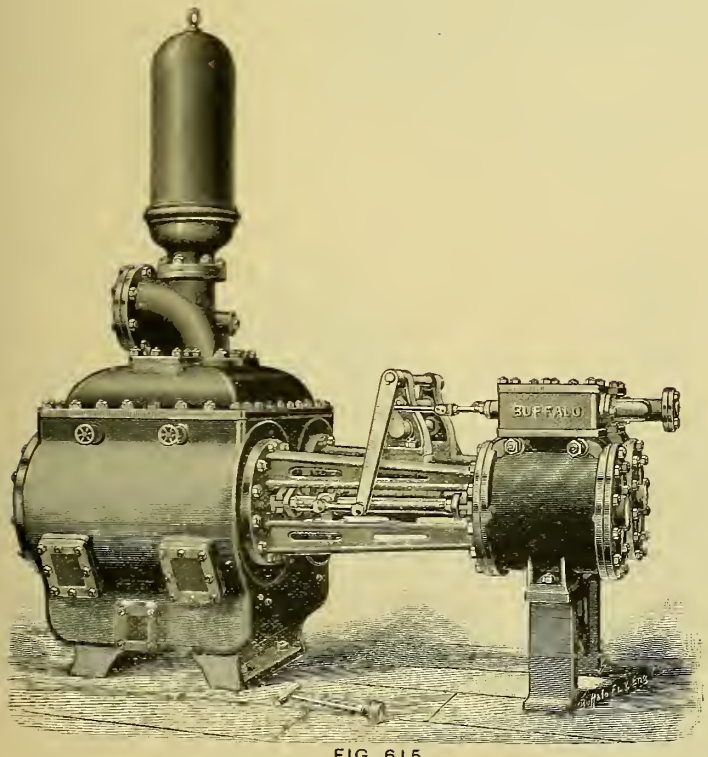
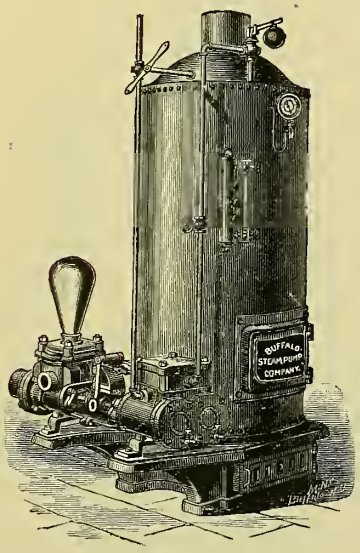


FIG. 615.
LOW SERVICE OR TANK PUMP.



616.
PUMP AND BOILER COMBINED.

Pump Catalogue on Application.

BUFFALO STEAM PUMPS.

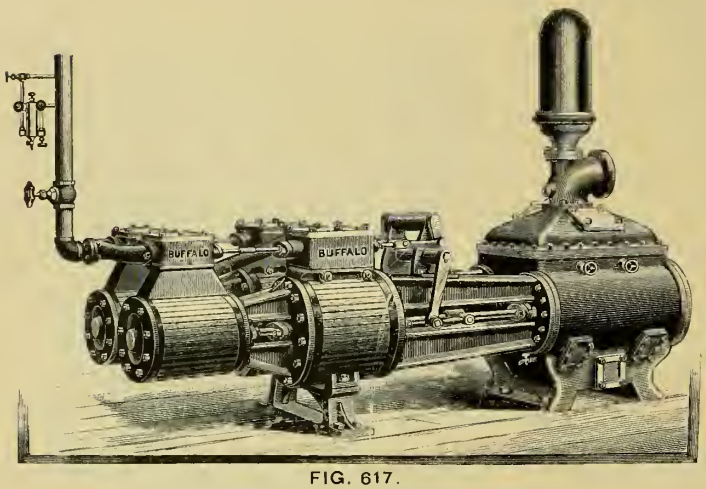


FIG. 617.
COMPOUND DUPLEX PUMP.
NON-CONDENSING.

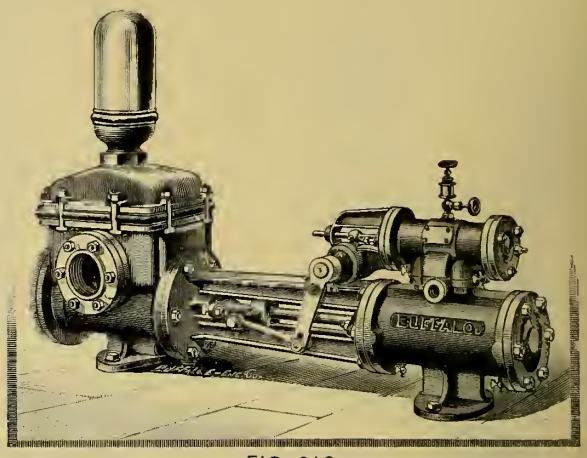


FIG. 619.
IMPROVED SINGLE CYLINDER PUMP.

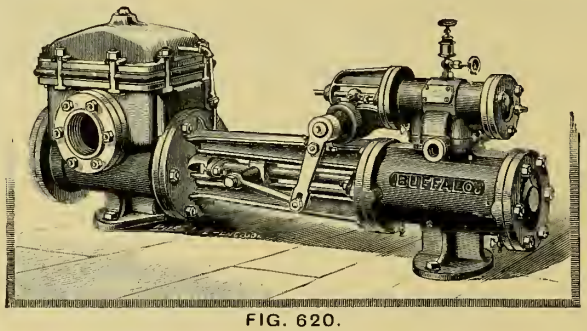


FIG. 620.
IMPROVED SINGLE CYLINDER.
VACUUM PUMP.

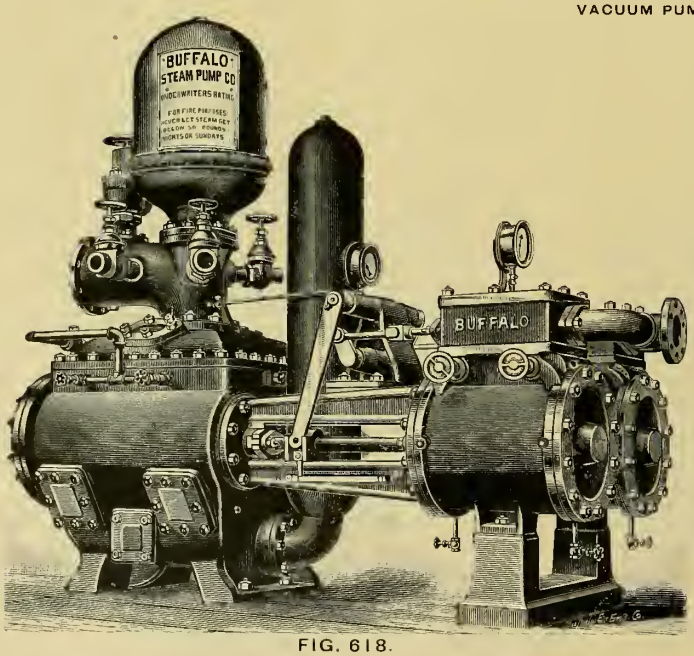


FIG. 618.
UNDERWRITERS' FIRE PUMP.

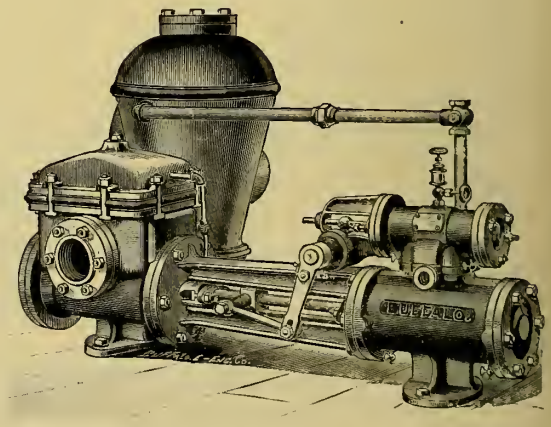


FIG. 621.
IMPROVED SINGLE CYLINDER.
INDEPENDENT AIR PUMP AND JET CONDENSER.

Pump Catalogue on Application.

BUFFALO DUPLEX STEAM PUMPS.

DUPLEX PUMP

WITH

EXTERNAL

CENTRE PACKED

PLUNGERS.

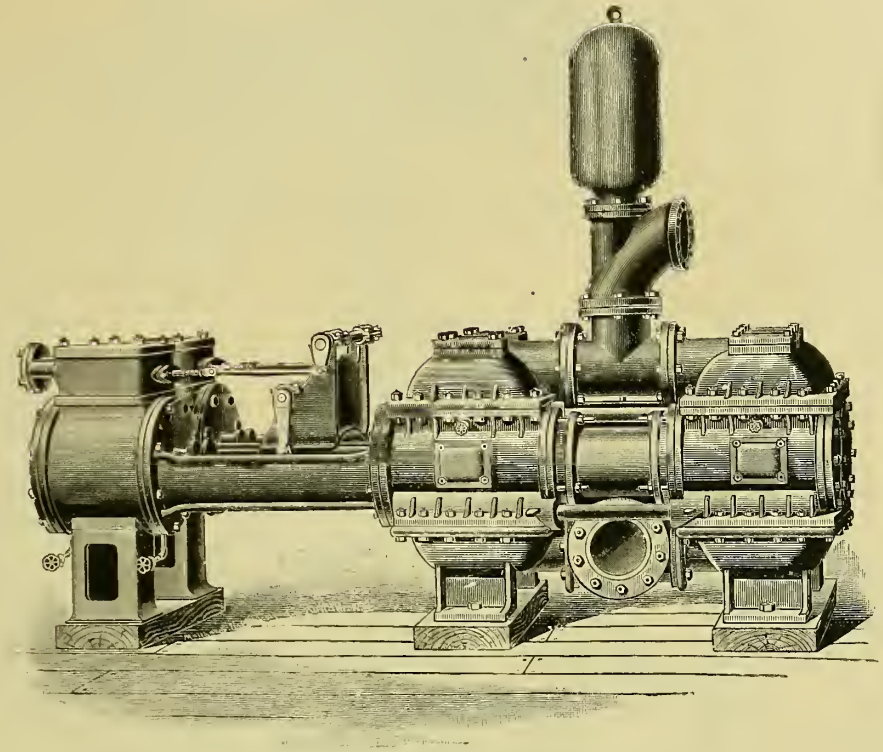
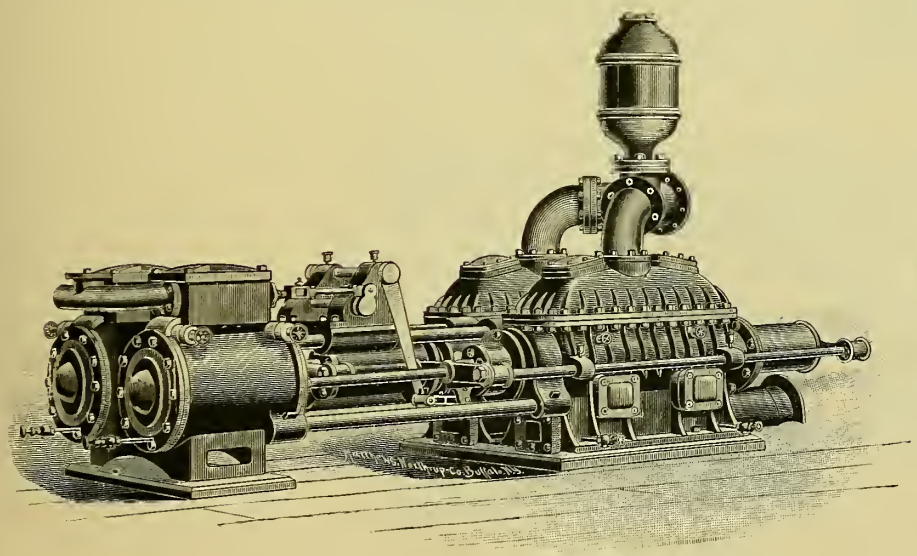


FIG. 622.



DUPLEX PUMP

WITH

EXTERNAL PACKED

PLUNGERS.

OUTSIDE

CONNECTED.

FIG. 623.

Pump Catalogue on Application.

BUFFALO STEAM PUMPS.

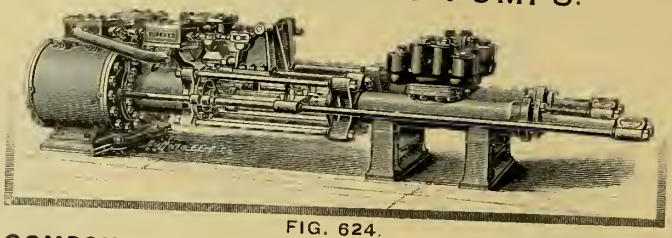


FIG. 624.

COMPOUND DUPLEX HYDRAULIC PRESSURE PUMP.

BUFFALO DUPLEX POWER PUMP.

STYLE "B."

WITH INDEPENDENT WATER CYLINDERS.

Size, 6-inch Piston, 10-inch Stroke.

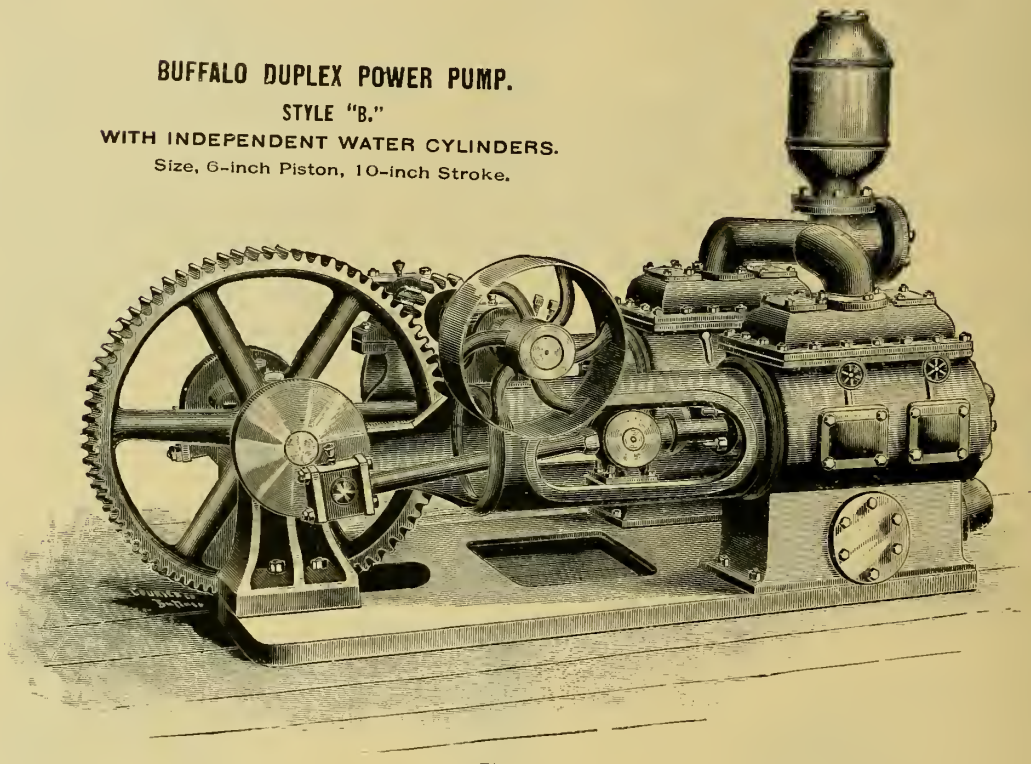


FIG 625.

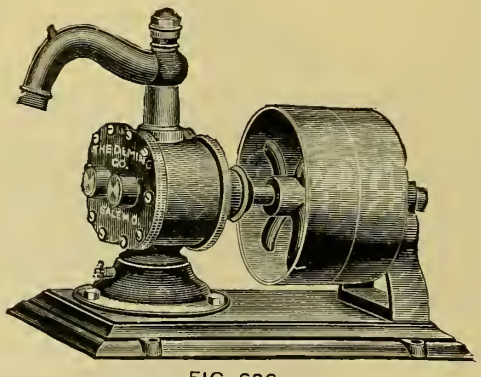


FIG. 626.

ROTARY FORCE PUMP.

Pump Catalogue on Application.

SNOW DUPLEX STEAM PUMPS.

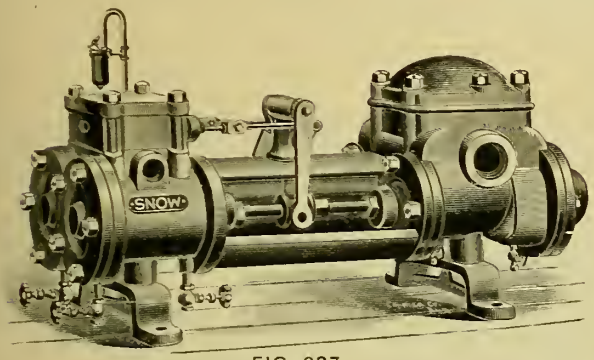


FIG. 627.
BOILER FEED PUMP.

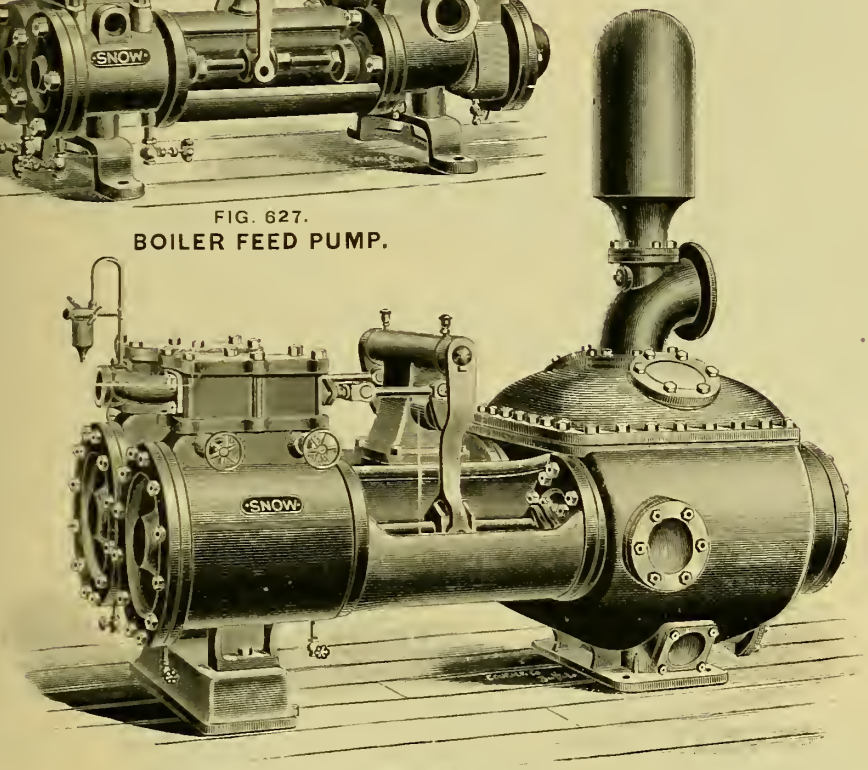


FIG. 628.
PLUNGER PUMP.

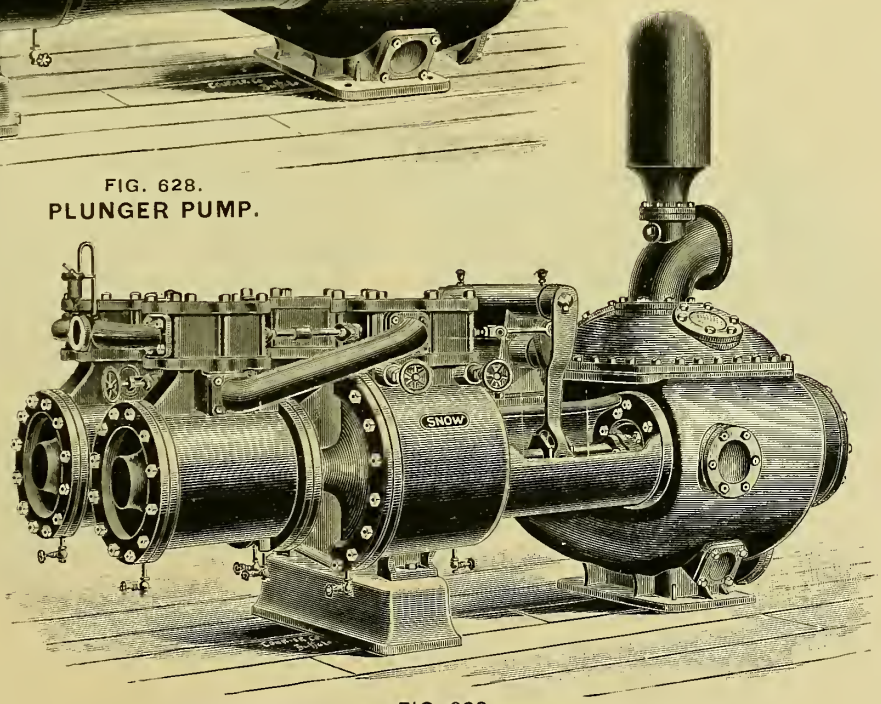


FIG. 629.
COMPOUND PUMP.

Pump Catalogue on Application.

SNOW DUPLEX STEAM PUMPS.

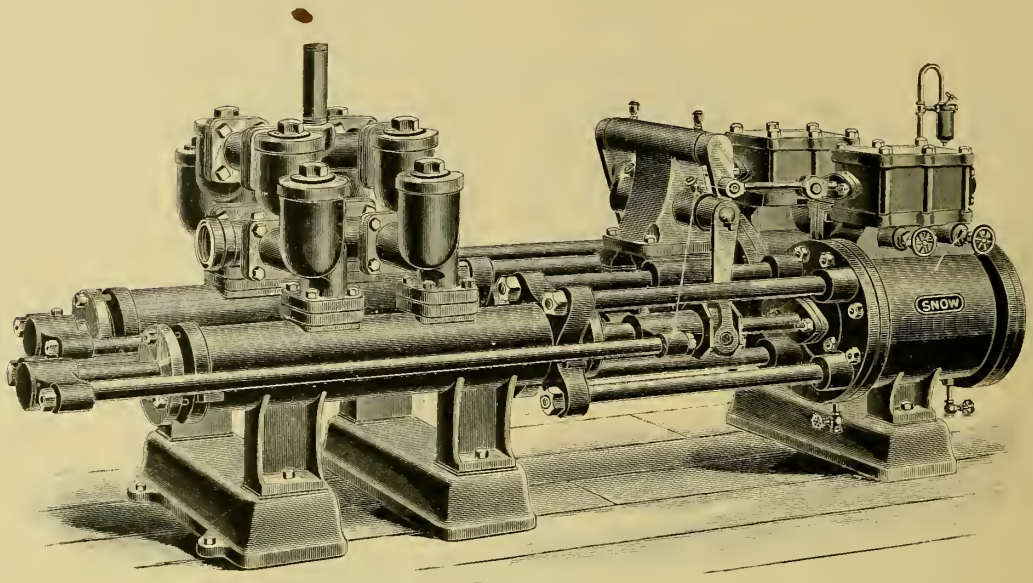


FIG. 630.
HYDRAULIC PRESSURE PUMP.

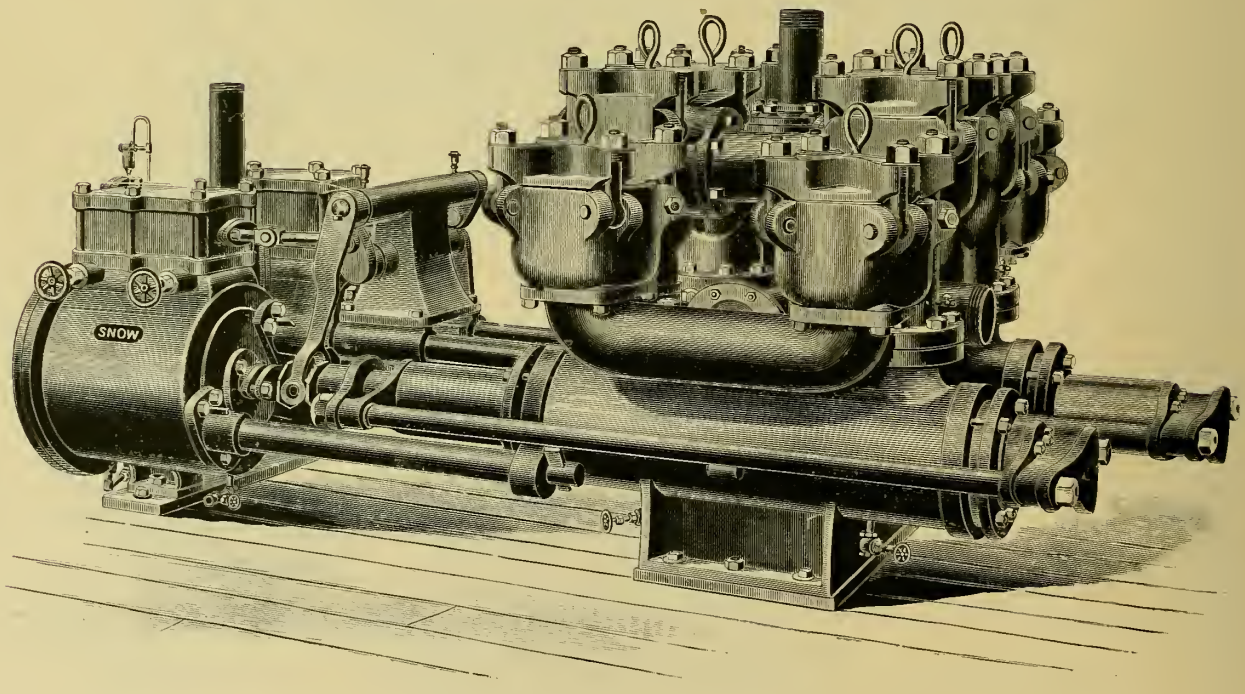


FIG. 631.
MINE PUMP—HIGH PRESSURE.

Pump Catalogue on Application.

HORIZONTAL OR VERTICAL CYLINDERS (60 inch Diameter or less) REBORED

In their permanent position anywhere in the U. S.

ALSO

CORLISS VALVES, LARGE BEARINGS, GEAR AND FLY WHEELS.

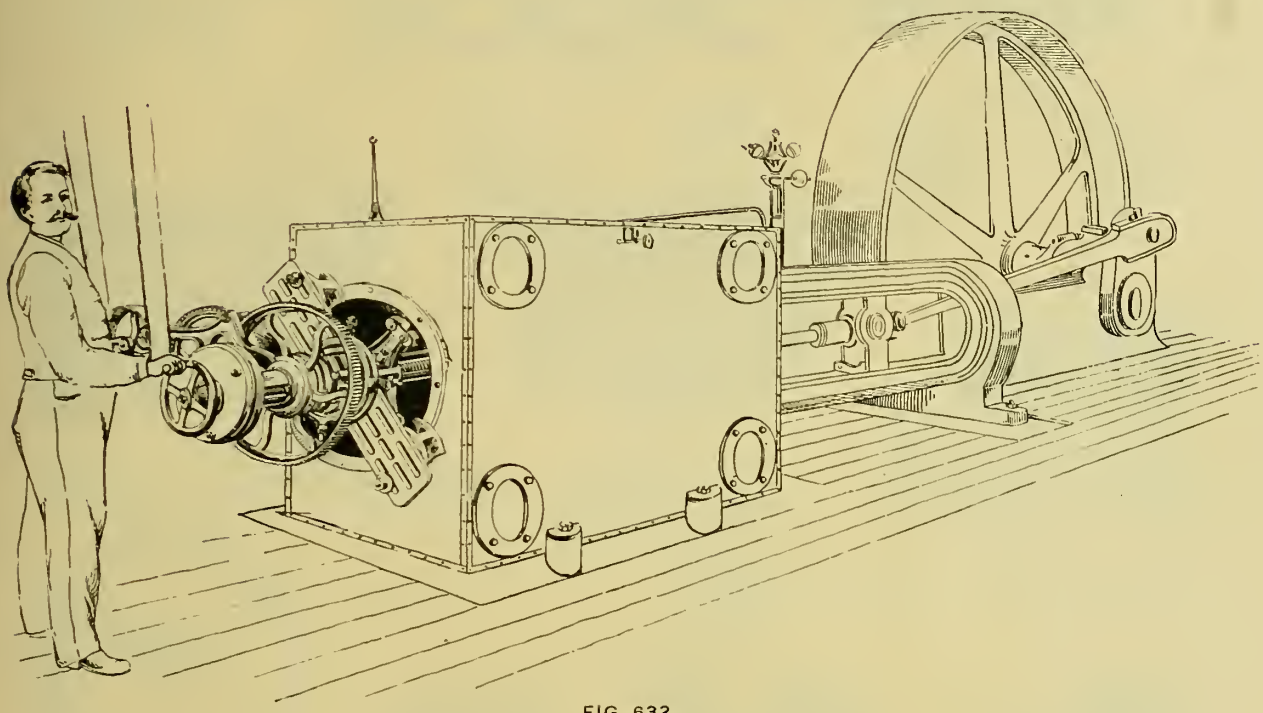


FIG. 632

WE MAKE

PISTON HEADS (Steel or Iron) 60 INCHES DIAM. or less.
PACKING RINGS of CLIMAX BRONZE, BABBITT, Steel or Iron.
PISTON RODS of COLD ROLLED STEEL or PHOSPHOR BRONZE.
STEEL SHAFTS, CRANKS, PITMANS, KEYS, Etc.
CLIMAX BRONZE BEARINGS AND SLIDES.
PITMAN & STRAP BRASSES, Etc., Etc.

REPAIRS

FOR ALL STYLES AND SIZES OF ENGINES.

PUMPS AND SPECIAL MACHINERY AT SHORT NOTICE.

Estimates furnished on Application.

HOSE, PACKING, ETC.

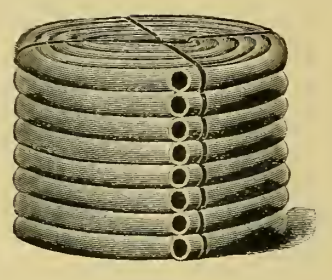


FIG. 633.
RUBBER HOSE.
FROM ½ IN. TO 4 IN. AND FROM 2 TO 6 PLY.

FIG. 634.
STEEL WIRE WRAPPED HOSE.

FIG. 635.
RUBBER SUCTION HOSE

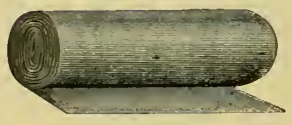


FIG. 636.
SHEET PACKING.
FROM 1-64 TO ¼ IN. THICK.

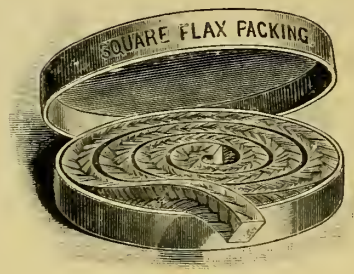


FIG. 637.
FLAX PACKING.

FIG. 638.
JENKINS' PACKING.

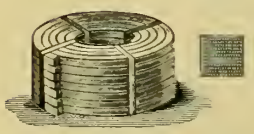


FIG. 639.
SQUARE
PISTON PACKING.

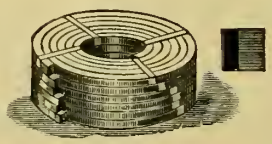


FIG. 640.
RUBBER BACK
PISTON PACKING.

FIG. 641.
GARLOCK'S
ELASTIC PACKING.

FIG. 642.
USUDURIAN PACKING.
SELF-VULCANIZING.

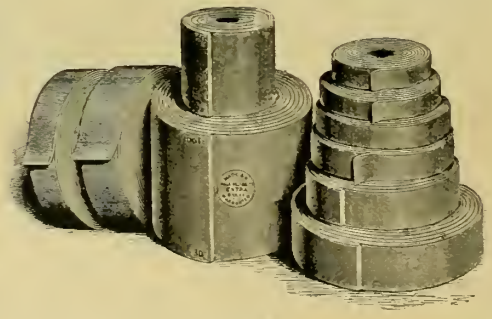


FIG. 643.
RUBBER BELTING. **LEATHER BELTING.**
FROM 1 IN. TO 52 IN. WIDE. FROM 2 TO 8 PLY.
FROM 1 IN. TO 48 IN. WIDE.

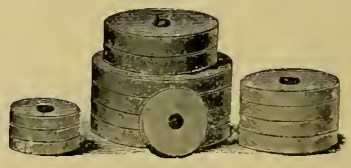


FIG. 644.
PUMP VALVES.
HARD AND SOFT RUBBER OR BRASS.

FIG. 645.
STRAIGHT.

BRASS PUMP SPRINGS.

FIG. 646.
CONICAL.

Special Packings Furnished.

SECTIONAL COVERINGS FOR STEAM PIPES.

MAGNESIA COVERING.

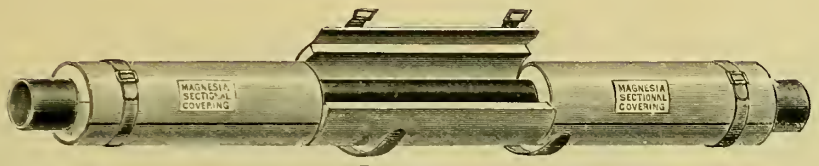


FIG. 647.

FIG. 648.

FIG. 649.

FIG. 650.

FIG 651.

FIG. 652.

FIG. 653.

MAGNESIA OR MAGNABESTOS COVERING FOR FITTINGS.

FIG. 654.

MAGNABESTOS COVERING.

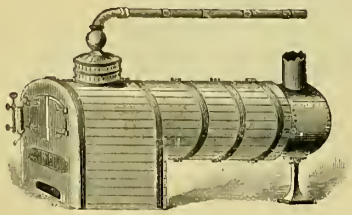


FIG. 655.

MAGNESIA OR MAGNABESTOS.

SECTIONAL BLOCKS AND PLASTIC COVERING.

FIG. 656.

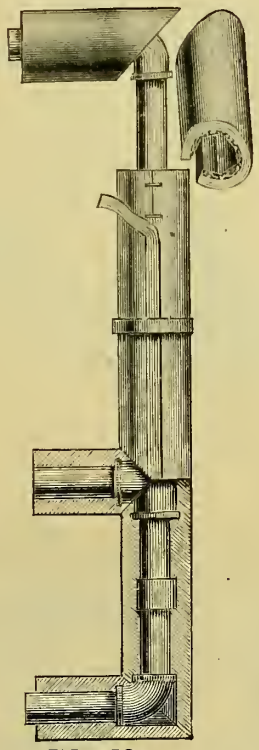


FIG. 658.

ABESTOS SECTIONAL COVERING.

ATTACHED TO PIPE.

FIG. 657.

Mineral Wool, Hair Felt, &c., Furnished as Desired.

CLIMAX BRONZE AND BRASS CASTINGS

From 1-2 oz. to 12,000 lbs. Weight.
ROUGH OR FINISHED.

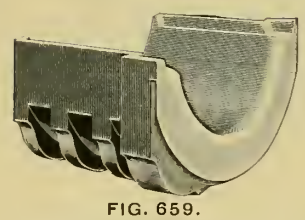


FIG. 659.
ROLL AND ENGINE BEARINGS.

FIG. 660.
STRAP BRASSES.

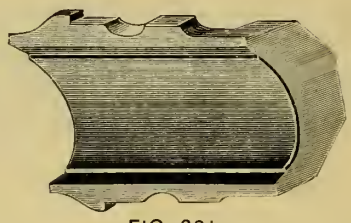


FIG. 661.
CAR BEARINGS.
WITH OR WITHOUT LEAD LINING.

FIG. 662.
LOCOMOTIVE DRIVING BOX BRASSES.

FIG. 663.
STEP BEARINGS.

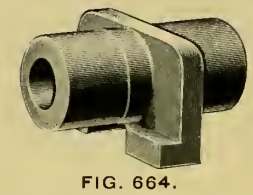


FIG. 664.
BUSHINGS
FOR BLOOMING MILL TABLES.

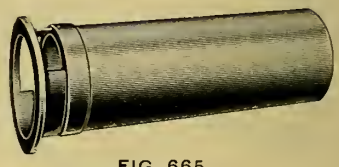


FIG. 665.
PUMP LININGS.
OR BUSHINGS.

FOR ELECTRIC CARS.

PINIONS. **BEARINGS.**

FIG. 667.
PLAIN.

FIG. 668.
BEVEL.

FIG. 669.
PLAIN.

FIG. 670.
WITH COLLAR.

FIG. 666.
BRONZE PISTON RODS.
ANY DIAMETER OR LENGTH,
WITH OR WITHOUT STEEL CENTRES.

FIG. 671.
TROLLEY SWITCHES.

FIG. 672.
TROLLEY WHEELS.

FIG. 673.
ONE PIECE GEAR WHEEL.
IRON AND STEEL.

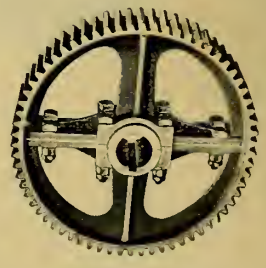


FIG. 674.
SPLIT GEAR WHEEL.
IRON AND STEEL.

CLIMAX BRONZE AND BRASS CASTINGS.

ROUGH OR FINISHED.

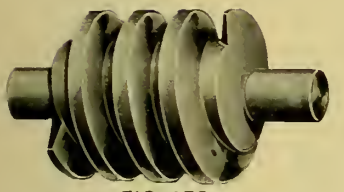


FIG. 675.

WORM WHEEL

CLIMAX BRONZE GRADE.

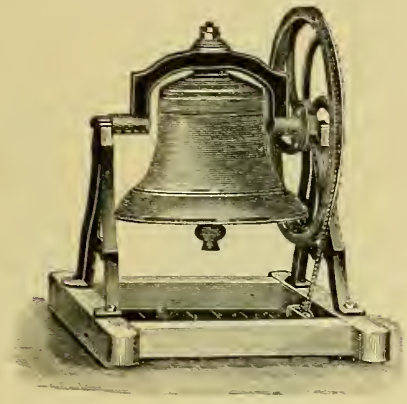


FIG. 676.

BELLS OF ANY SIZE AND TONE.

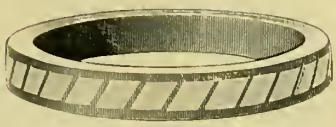


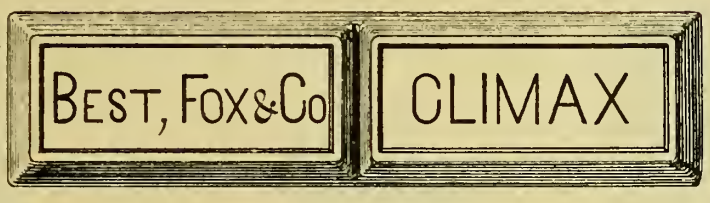
FIG. 677.

PACKING RINGS

OF ANY SIZE.

PLAIN OR BABBITTED.

Grade XX Phosphorized
Grade XX
" X
" A



Grade B
" C
" D
" E

FIG. 578.

CLIMAX BABBITT METAL.

ALL GRADES.

FIG. 679.

INGOT CLIMAX BRONZE.
INGOT BRASS.

ALL GRADES.

FIG. 681.

PHOSPHOR TIN.

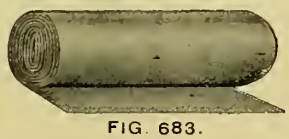


FIG. 683.

SHEET LEAD.

ANY THICKNESS.

FIG. 685.

ROUND COPPER ROD.
" BRASS "

ALL SIZES.

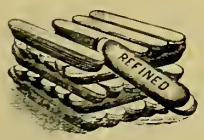


FIG. 680.

PIG LEAD.

FIG. 682.

ALUMINUM.

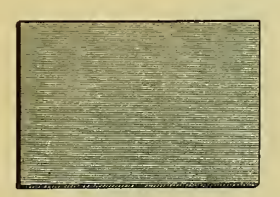


FIG. 684.

SHEET COPPER.
" BRASS.

ANY THICKNESS.

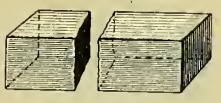


FIG. 686.

SQUARE COPPER ROD.
" BRASS "

ALL SIZES.

See Table—Page 114.

BLAST FURNACE SPECIALTIES. CLIMAX BRONZE TUYERES.

(800 PATTERNS TO SELECT FROM)

SHORT—Less than 12 in. long. MEDIUM—Between 12 and 16 in. long. LONG—Over 16 in. long.

CLASS A.

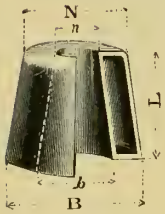


FIG. 687.
SHORT.

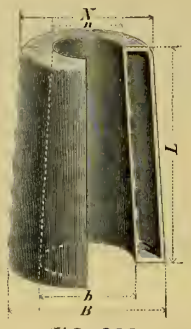


FIG. 688.
MEDIUM.

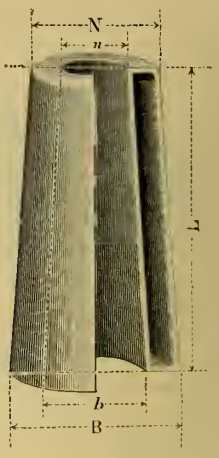


FIG. 689.
LONG.

CLASS B.

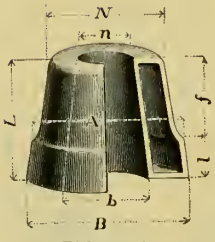


FIG. 690.
SHORT.

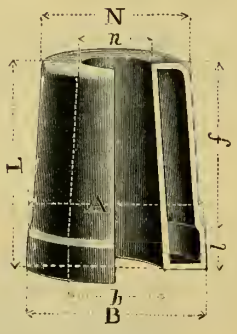


FIG. 691.
MEDIUM.

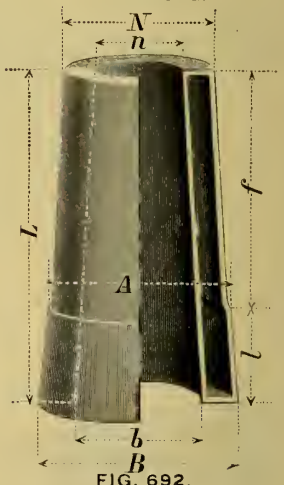


FIG. 692.
LONG.

CLASS C.

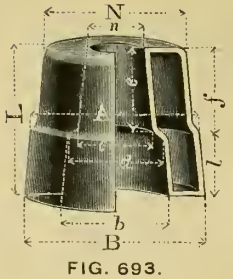


FIG. 693.
SHORT.

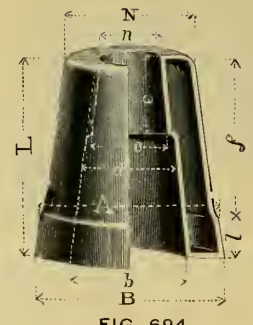


FIG. 694.
MEDIUM.

CLASS D.

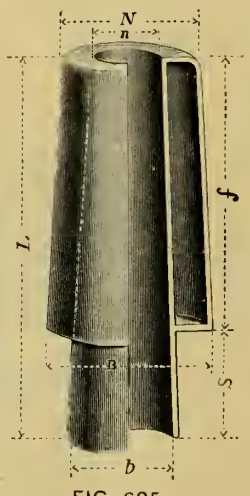


FIG. 695.
LONG.

CLASS E.

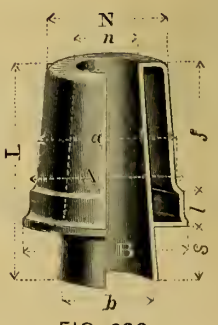


FIG. 696.

See Catalogue F for Dimensions of Above.

CLIMAX BRONZE TUYERES, NOTCHES AND COOLERS.

(800 PATTERNS TO SELECT FROM.)

SHORT—Less than 12 in. long. MEDIUM—Between 12 and 16 in. long. LONG—Over 16 in. long.

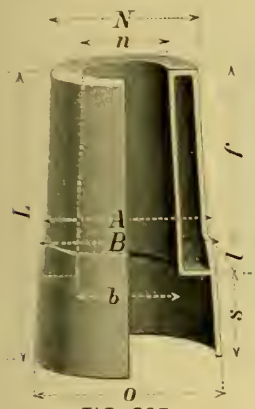


FIG. 697.
CLASS F.
LONG.

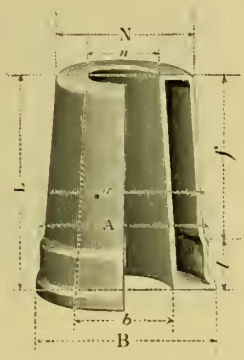


FIG. 698.
CLASS G.
MEDIUM.

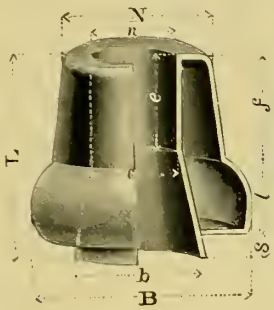


FIG. 699
CLASS H.

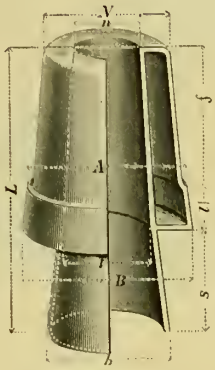


FIG. 700.
CLASS I.

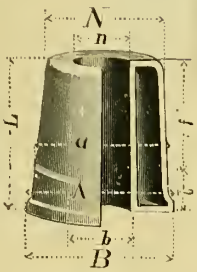


FIG. 701
CLASS J.

NOTCHES.

SHORT—Less than 10 in. long. MEDIUM—Between 10 and 15 in.
LONG—Over 15 in. long.

FIG 702.

FIG. 703.
CLASS A.
SHORT. LONG.

FIG. 704.

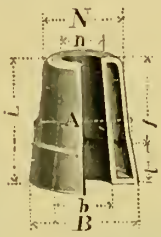


FIG. 705.
CLASS B.
SHORT. MEDIUM

FIG. 706.

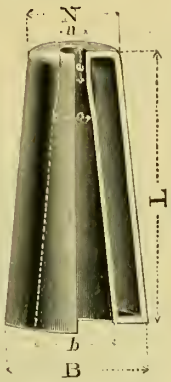


FIG. 707.
CLASS C.
LONG.

FIG. 708.
CLASS D.

COOLERS.

SHORT—Less than 22 in. long. LONG—Over 22 in. long.

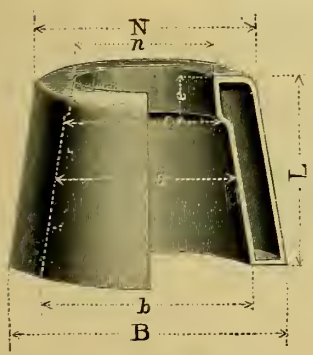


FIG. 709.
SHORT.

COOLERS. CLASS A.

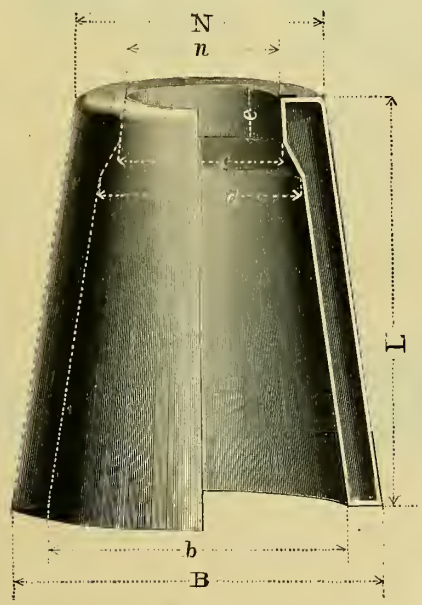


FIG. 710.
LONG.

See Catalogue F for Dimensions of Above.

CLIMAX BRONZE COOLERS, NOTCH COOLERS, ETC.

SHORT—Less than 22 in. long. LONG—Over 22 in. long.

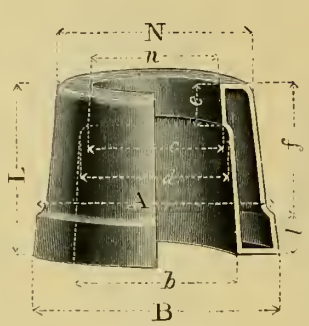


FIG. 711.
CLASS B.
SHORT.

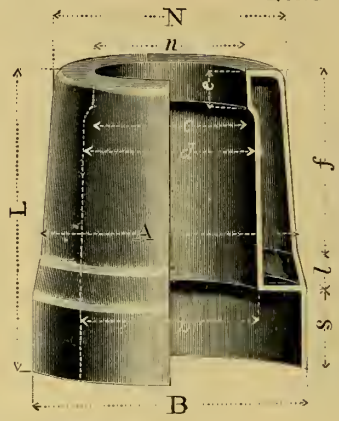


FIG. 712.
CLASS F.
LONG.

NOTCH COOLERS.

SHORT—Less than 12 in. long. MEDIUM—Between 12 and 16 in. long LONG—Over 16 in. long.

CLASS C. **CLASS D.**

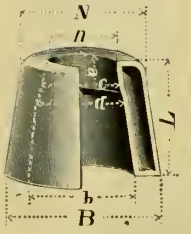


FIG. 713.
SHORT.

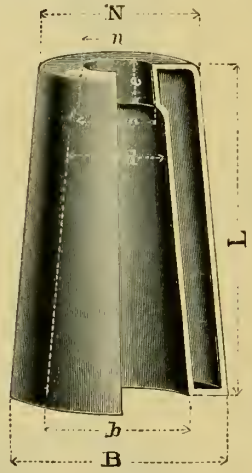


FIG. 714.
LONG.

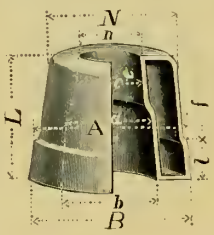


FIG. 715.
SHORT.

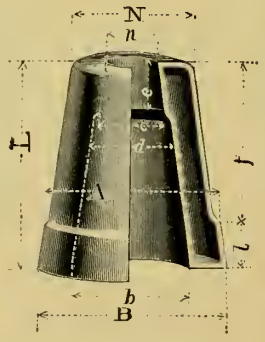


FIG. 716.
MEDIUM.

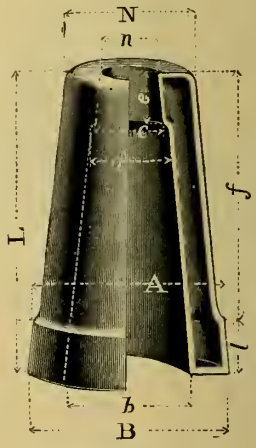


FIG 717.
LONG.

BOSH BOXES. (FRONHEISER'S PATENT.)

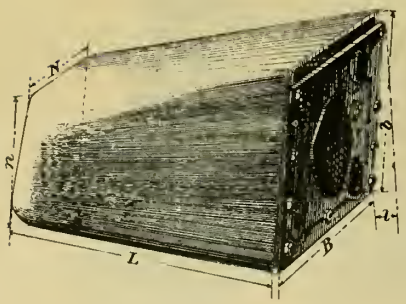


FIG. 718.
CLASS A.

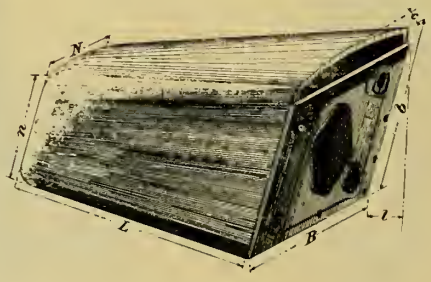


FIG. 719.
CLASS B.

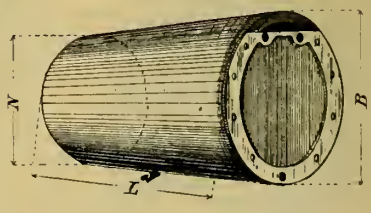


FIG. 720.
CLASS C.

See Catalogue F for Dimensions of Above.

CLIMAX BRONZE BOSH PLATES, JACKETS, ETC.

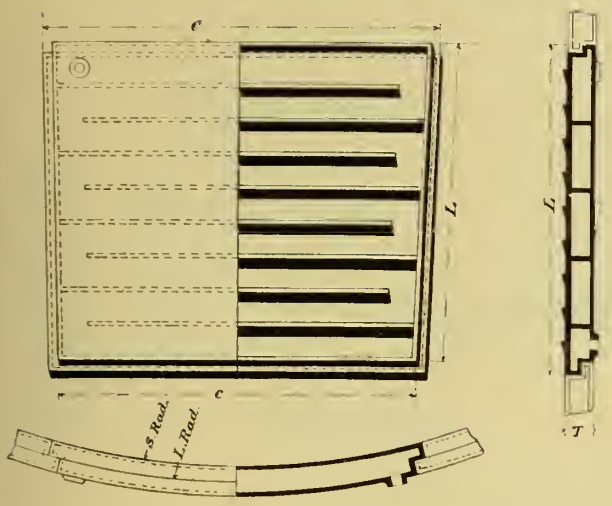


FIG. 721.
HUNT'S PATENT BOSH JACKET.

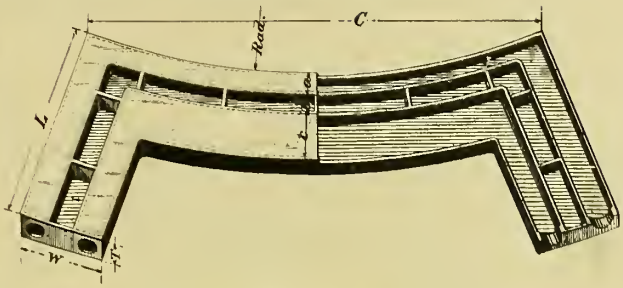


FIG. 722.
BOSH PLATE.
CLASS A.
(KENNEDY'S PATENT.

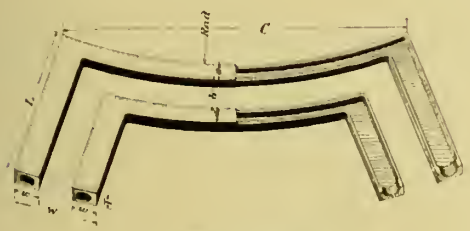


FIG. 723.
BOSH PLATE.
CLASS B.

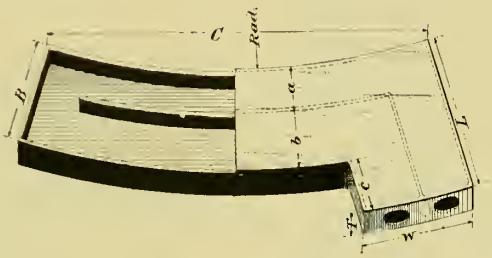


FIG. 724.
BOSH PLATE.
CLASS C.
(POLLOCK'S PATENT.)

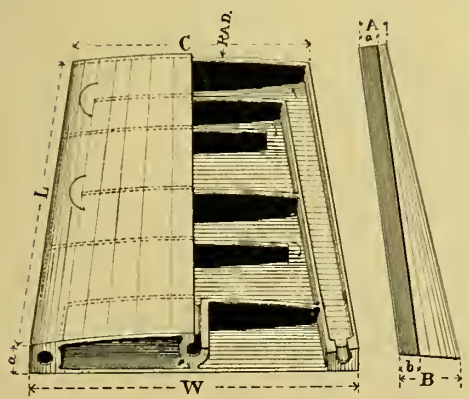


FIG. 725.
BOSH PLATE.
CLASS D.
(SCOTT'S PATENT.)

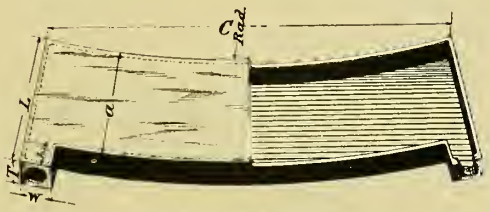


FIG. 726.
BOSH PLATE.
CLASS E.

See Catalogue F for Dimensions of Above.

CLIMAX BRONZE BOSH PLATES, AND VALVE SEATS.

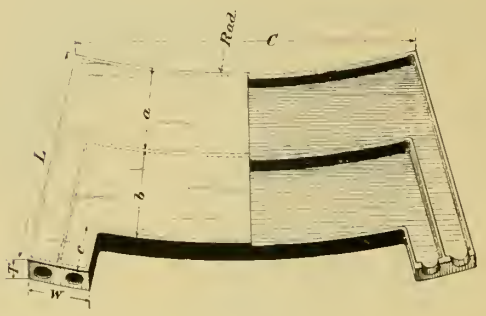


FIG. 727.
BOSH PLATE.
CLASS F.

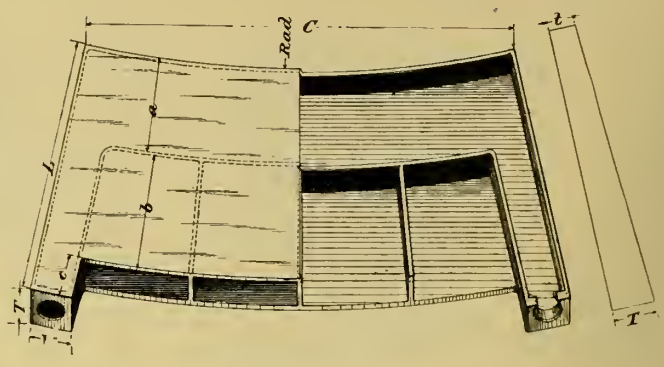


FIG. 728.
BOSH PLATE.
CLASS G. (GAYLEY'S PATENT.

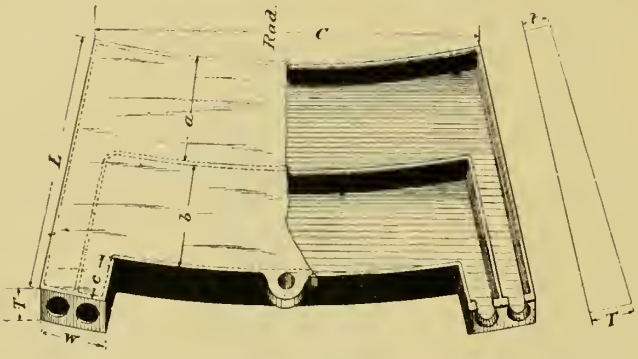


FIG. 729.
BOSH PLATE.
CLASS H. (GAYLEY'S PATENT.)

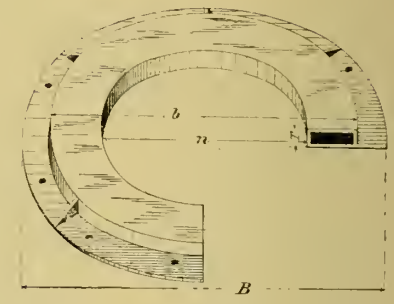


FIG. 730.
VALVE SEAT.
CLASS A.

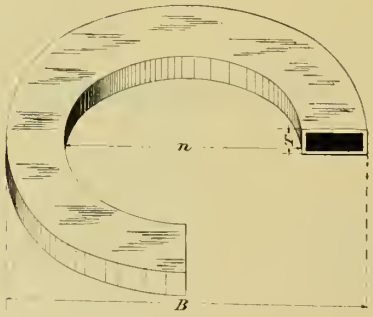


FIG. 731.
VALVE SEAT.
CLASS B.

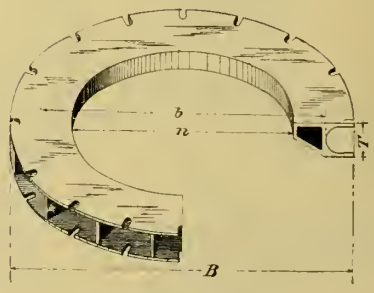


FIG. 732.
VALVE SEAT.
CLASS C.

See Catalogue F for Dimensions of Above.

CLIMAX BRONZE VALVE SEATS AND VALVES.

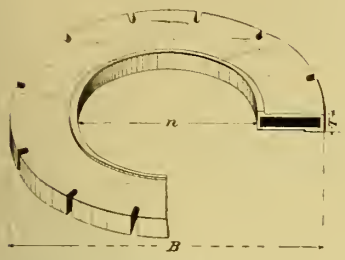


FIG. 733
VALVE SEAT.
CLASS D.

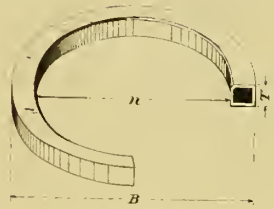


FIG. 734.
VALVE SEAT.
CLASS E.

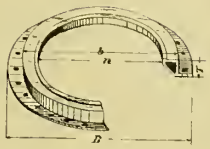


FIG. 735.
VALVE SEAT.
CLASS F.

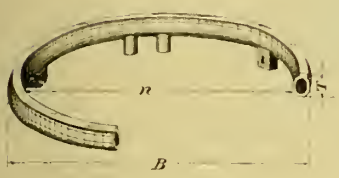


FIG. 736.
VALVE SEAT.
CLASS G.

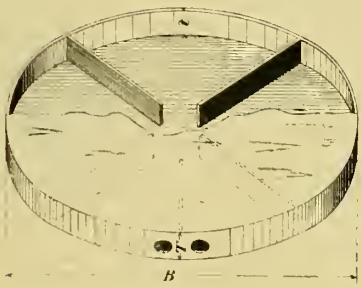


FIG. 737.
VALVE.
CLASS A.

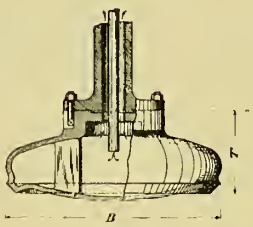


FIG. 738.
VALVE.
CLASS B.

See Catalogue F for Dimensions of above.

WATER AND AIR COOLED DEVICES

OF ANY SHAPE MADE OF

CLIMAX BRONZE,

SILVER,
COPPER,
FOR
GLASS,
STEEL
AND IRON

SMELTING FURNACES.

CORRESPONDENCE SOLICITED.

BY-PASS FOR TANKS, HEATER EXHAUST, WATER TO BOILERS, AND STEAM MAINS.

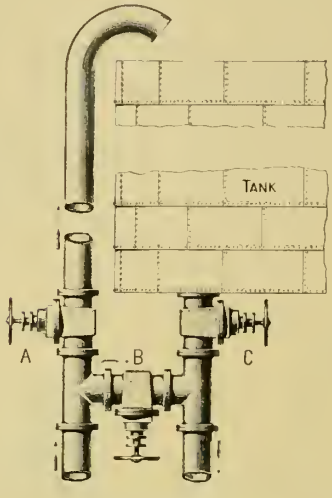


FIG. 739.
TANK BY-PASS.

BALANCED VALVE.
FOR TANKS.
WITH COPPER FLOAT.

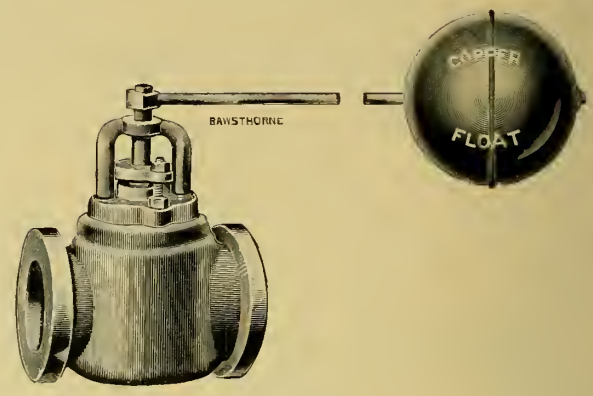


FIG. 739½.
See also page 77.

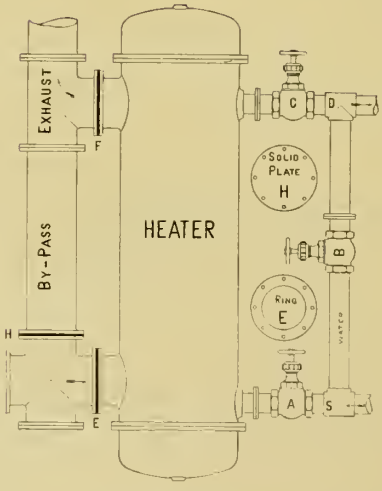


FIG. 740.
HEATER BY-PASS.

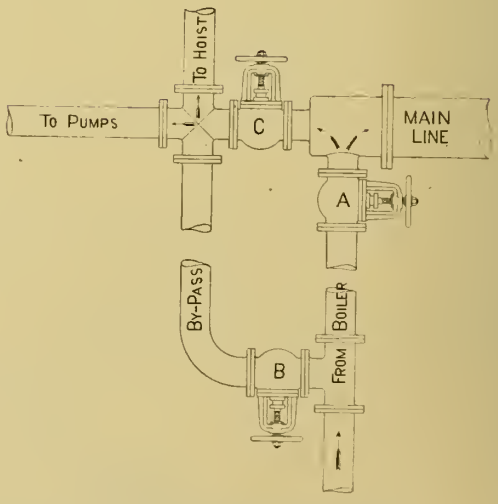


FIG. 741
STEAM LINE BY-PASS.

See Description Next Page

TANK BY-PASS.

Direct pressure from pump to furnace, independent of tank, is obtained, as shown by cut, by closing valves *A* and *C* and opening valve *B*. Tank can then be thoroughly cleaned. By-pass connection need not be placed close to tank. Any convenient point between lines to and from tank will answer for this purpose.

HEATER BY-PASS.

S indicates the cold water supply to the heater. *D*, the hot water line from the heater. If the heater needs repairing, close valves *A* and *C* and open by-pass valve *B*. If exhaust connection is made to heater, as shown on the left of same, it can be by-passed by removing liner or rings *E* and *F* and putting in their places plate *H* and a spare plate same as *H*. Then no exhaust can get into heater.

Put ring *E* where *H* was and steam will pass direct from Cross up through Tee and into atmosphere.

Plates and rings *E*, *F* and *H* are made of bronze ¼ or ⅜ inch thick, so as to prevent rusting and allowing ready removal.

This arrangement saves the expense of three valves and is very neat and compact.

STEAM LINE BY-PASS.

In Blast Furnace practice it is often the case that steam is required only for the pumps and hoist, when the furnace is banked or not blowing, and it is not desirable to have steam in the entire main line. Using the main steam line for this purpose can be avoided by arranging pipe system as shown. Close valves *A* and *C* and steam can be furnished through valve *B*, by only firing one battery of boilers.

WE MANUFACTURE

CLIMAX BRONZE CASTINGS,

Which we claim to be superior to any bronze in use, and guaranteed for the following purposes:

Grade A.—For Blast Furnace Tuyeres, Bosh Plates, etc.

Grade B.—For general machine castings, Piston Rods, Cog Wheels, Racks and Pinions, Pump Linings, Bolts, Step Bearings and Hydraulic Work of all kinds, **hard and strong.**

Grade C.—For Heated Rolls, Hydraulic Cranes, Nail Machines, etc., **very tough and hard.**

Grade D.—For Packing Rings, for all purposes **very strong.**

Grade E.—For Bells, Gongs, etc.

Grade F.—For Heavy Bearings for Rolls, Engines, Car Bearings, Locomotive Driving Boxes, Collar Bearings, Heavy Slides, etc. This grade is made **hard and strong,** so as to **resist great pressure,** and is of such a nature as not to cut the journals.

Grade H.—For work subject to acids, chemicals, etc. Designed to take the place of ordinary **acid metal,** being much harder and stronger.

"Climax Bronze" of any grade, **in ingots,** in large or small quantities, at a price that enables it to compete with any other Bronze in the market.

PHOSPHORIZED INGOT COPPER.

Made of several grades to suit various purposes, **Guaranteed** to produce **Genuine Phosphor-Bronze Castings,** without additional mixture of metals.

MATERIAL NOT ILLUSTRATED.

Cotton and Hemp Packing,
Sheet Asbestos.
Asbestos Rope Packing,
Plumbago Packing,
Gasket Board.
Soil Pipe Fittings.
Sewer Pipe and Fittings.
Gaskets of any material.
Chain Belting and Shives.
Brass, Copper, Steel and Iron Wire.
Bar and Sheet Iron and Steel.
Bar, Sheet and Spring Steel.
Recording Gauges.
Natural Gas Supplies.
Crucibles and Plumbago.
Phosphorus.
Coal, Ore and Sand Screens.
Thermometers.

BEST, FOX & CO.'S

DIMENSIONS

OF

FITTINGS, VALVES, FLANGES,

STEEL, WROUGHT AND CAST IRON PIPE,

BRASS, COPPER AND LEAD PIPE,

STEEL AND COPPER BENDS,

&C., &C.

For the Convenience of Engineers and Draughtsmen we have embodied in Pamphlet K these tables from Pages 100 to 114. Furnished on application.

BEST, FOX & COMPANY'S

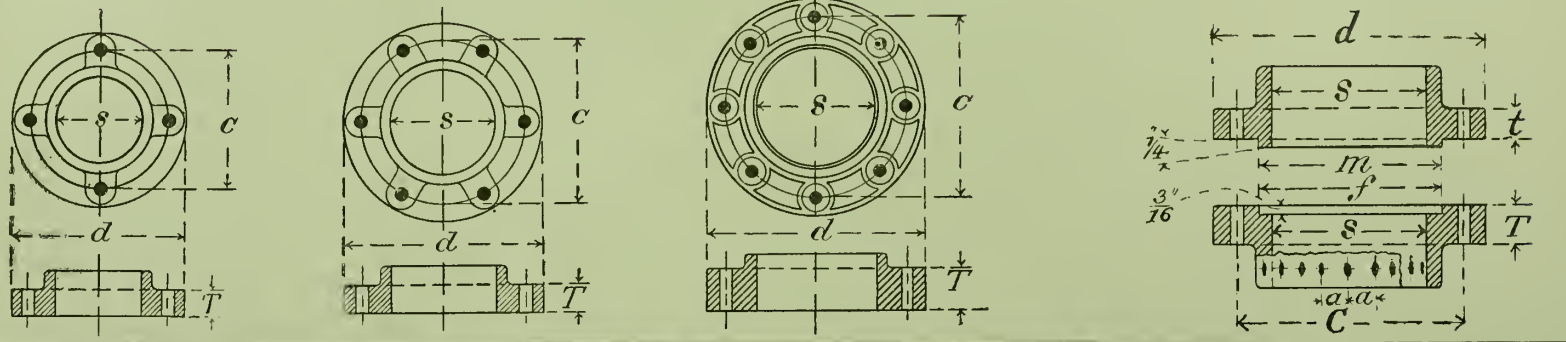
STANDARD DIMENSIONS

(BASED ON 10 YEARS PRACTICAL EXPERIENCE)

—OF—

CAST IRON AND CAST STEEL FLANGES

FOR THREADED I. D. (INSIDE DIAM.) PIPE.



A LIGHT. SUITABLE FOR PRESSURE TO 50 LBS.

B MEDIUM. HEAVY. **C** SUITABLE FOR PRESSURE TO 100 LBS. TO 125 LBS.

D EXTRA HEAVY. SUITABLE FOR PRESSURE FROM 150 TO 300 LBS.

E EXTRA HEAVY RIVETTED. SUITABLE FOR PRESSURE FROM 150 TO 300 LBS.

s	d	HOLES. No.	HOLES. Size.	HOLES. C	T
2	6	4	5/8	4 1/2	7/8
2 1/2	6 1/2	4	5/8	5	7/8
3	7	4	5/8	5 1/2	15/16
3 1/2	7 1/2	4	5/8	6	15/16
4	8 1/2	4	3/4	7	1
4 1/2	9	6	3/4	7 1/4	1
5	10	6	3/4	8 1/4	1 1/8
6	11	6	3/4	9 1/4	1 1/8
7	12	6	3/4	10 1/4	1 1/8
8	13	6	7/8	11 1/4	1 1/4
9	15	6	7/8	13 1/4	1 1/4
10	16	8	7/8	14 1/4	1 3/8
12	17	8	7/8	15 1/4	1 1/2

s	d	HOLES. No.	HOLES. Size.	HOLES. C	T
2	6	4	5/8	4 1/2	1
2 1/2	7	4	5/8	5 1/2	1
3	7 1/2	4	5/8	6	1 1/16
3 1/2	8	4	5/8	6 1/2	1 1/8
4	8 1/2	6	3/4	7	1 1/8
4 1/2	9	6	3/4	7 1/4	1 1/4
5	10	6	3/4	8 1/4	1 1/4
6	11	6	3/4	9 1/4	1 1/4
7	12	6	3/4	10 1/4	1 5/16
8	14	8	7/8	12 1/4	1 3/8
9	15	8	7/8	13 1/4	1 7/16
10	16	8	7/8	14 1/4	1 1/2
12	18	10	7/8	16 1/4	1 5/8

HEAVY. C. I. T	HEAVY. Steel. * T
1 1/8	...
1 1/8	...
1 1/4	...
1 5/16	...
1 3/8	3/4
1 1/2	3/4
1 1/2	3/4
1 5/8	7/8
1 3/4	1
1 13/16	1 1/8
1 7/8	1 1/8
2	1 1/4
2 1/8	1 1/4

s	d	HOLES. No.	HOLES. Size.	HOLES. C	T	Steel. * T
2	6 1/2	4	5/8	5	1 1/8	...
2 1/2	7	4	5/8	5 1/2	1 1/4	...
3	8 3/4	4	3/4	7 1/4	1 3/8	...
3 1/2	9 1/4	6	3/4	7 1/2	1 1/2	...
4	9 1/2	6	3/4	7 3/4	1 1/2	7/8
4 1/2	10	6	3/4	8 1/4	1 5/8	7/8
5	11	6	7/8	9 1/4	1 5/8	1
6	12	6	7/8	10 1/4	1 3/4	1
7	13	6	7/8	11 1/4	1 7/8	1 1/8
8	14	8	7/8	12 1/4	1 7/8	1 1/4
9	15	8	7/8	13 1/4	2	1 3/8
10	17 1/2	8	1	15 1/4	2 1/4	1 3/8
12	19 1/2	12	1	17 1/4	2 3/8	1 1/2

s	d	HOLES. No.	HOLES. Size.	HOLES. C	T	t	m	f	RIVETS. C to C Outside. Size.	RIVETS. C to C Outside. a	STEEL. T	STEEL. t
8	15 1/2	8	7/8	13 1/2	1 1 1/16	1 1/2	10 9/16	10 5/8	5/8	2	1 7/16	1 1/4
9	16 1/2	8	7/8	14 1/2	1 1 3/16	1 5/8	11 1/16	11 3/4	5/8	2	1 9/16	1 3/8
10	18	8	1	15 3/4	1 1 3/16	1 5/8	13 1/16	13 1/8	5/8	2	1 9/16	1 3/8
12	20 1/2	12	1	18 1/4	1 1 5/16	1 3/4	15 1/2	15 9/16	5/8	2	1 11/16	1 1/2
14	22	12	1	19 3/4	1 1 5/16	1 3/4	16 1/16	16 3/4	3/4	2 1/4	1 11/16	1 1/2
15	23	12	1	20 3/4	1 1 5/16	1 3/4	17 1/16	17 3/4	3/4	2 1/4	1 11/16	1 1/2
16	24	16	1	21 3/4	2	1 1 3/16	18 1/16	18 3/4	3/4	2 1/4	1 3/4	1 9/16
18	26 1/2	16	1 1/8	24	2 1/16	1 7/8	20 1/16	20 3/4	3/4	2 1/4	1 13/16	1 5/8
20	28 1/2	20	1 1/8	26	2 3/16	2	22 1/16	23	3/4	2 1/4	1 15/16	1 3/4
22	31	20	1 1/8	28 1/2	2 5/16	2 1/8	24 1/16	25	7/8	2 1/2	1 15/16	1 3/4
24	33	24	1 1/8	30 1/2	2 7/16	2 1/4	26 7/16	26 1/2	7/8	2 1/2	2 1/16	1 7/8
26	35 1/2	24	1 1/4	33	2 9/16	2 3/8	29 7/16	29 1/2	7/8	2 1/2	2 3/16	2
30	40	28	1 1/4	37 1/2	2 11/16	2 1/2	33 15/16	34	7/8	2 1/2	2 5/16	2 1/8

(OUTSIDE DIAMETER, INSIDE DIAM.)

ROLLED OR PRESSED STEEL FLANGES TO ORDER.

See Page.....

CAST IRON AND CAST STEEL HYDRAULIC FLANGES TO ORDER.

* STEEL FLANGES (THREADED) ARE NOT **RAISED HOLE.**

BEST, FOX & COMPANY'S

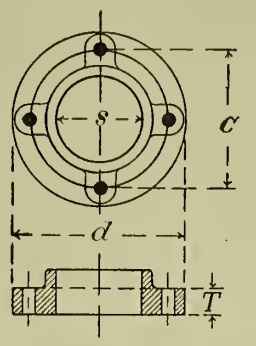
STANDARD DIMENSIONS

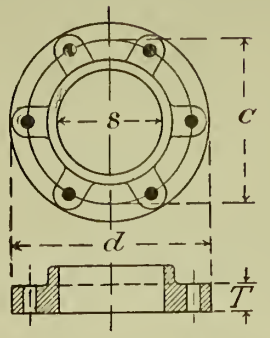
(BASED ON 10 YEARS PRACTICAL EXPERIENCE

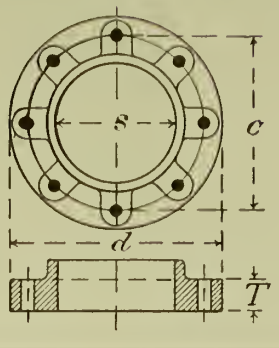
—OF—

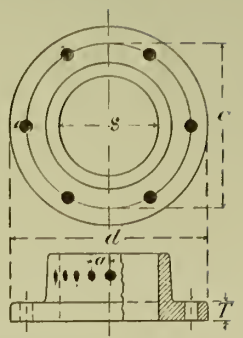
CAST IRON AND CAST STEEL FLANGES

For O. D. (OUTSIDE DIAM.) PIPE.









F LIGHT.

SUITABLE FOR PRESSURE TO 50 LBS.

s	d	HOLES. No.	HOLES. Size	HOLES. C	T
6	11	6	¾	9¼	2¼
7	12	6	¾	10¼	2⅜
8	13	6	⅞	11¼	2½
9	15	6	⅞	13¼	2⅝
10	16	8	⅞	14¼	2¾
12	17	8	⅞	15¼	3
14	19½	12	1	17¼	3¼
15	20½	12	1	18¼	3½
16	22	12	1	19¾	3¾
18	24	16	1	21¾	4
20	26	16	1	23¾	4¼
22	28	20	1	25¾	4½
24	30	20	1	27¾	4¾

C MEDIUM.

SUITABLE FOR PRESSURE TO 100 LBS.

s	d	HOLES. No.	HOLES. Size.	HOLES. C	T
6	11	6	¾	9¼	2¾
7	12	6	¾	10¼	2⅞
8	14	6	⅞	12¼	3
9	15	6	⅞	13¼	3⅛
10	16	8	⅞	14¼	3¼
12	18	8	⅞	16¼	3½
14	20	12	1	17¾	3⅝
15	21	12	1	18¾	3⅞
16	22	12	1	19¾	4
18	25	16	1	22¾	4¼
20	27	16	1	24¾	4½
22	29	20	1	26¾	4¾
24	32	20	1⅛	29½	5

H HEAVY.

SUITABLE FOR PRESSURE TO 150 LBS.

s	d	HOLES. No.	HOLES. Size	HOLES. C	T	STEEL. * T
6	12	6	⅞	10¼	3¼	1
7	13	6	⅞	11¼	3⅜	1⅛
8	14	8	⅞	12¼	3½	1¼
9	15	8	⅞	13¼	3⅝	1⅜
10	17	8	1	15	3¾	1⅜
12	19	12	1	17	4	1½
14	21	12	1	18¾	4¼	1½
15	22	12	1	19¾	4½	1½
16	23½	16	1	21¼	4¾	1 9/16
18	26	16	1⅛	23¾	5	1⅝
20	28	20	1⅛	25¾	5¼	1¾
22	30	20	1⅛	27¾	5½	1¾
24	32½	24	1⅛	30	6	1⅞

I LIGHT.

FOR RIVETTED PIPE SUITABLE FOR EXHAUST, AIR, &c.

s (OUTSIDE DIAMETER.)	d	HOLES. No.	HOLES. Size.	HOLES. C	T	RIVETS. C to C outside. Size.	RIVETS. C to C outside. a
8	13	6	⅞	11¼	¾	¼	1
10	16	8	⅞	14¼	⅞	⅜	1¼
12	17	8	⅞	15¼	⅞	⅜	1¼
14	19½	12	1	17¼	⅞	⅜	1¼
16	22	12	1	19¾	⅞	⅜	1¼
18	24	16	1	21¾	1	½	1½
20	26	16	1	23¾	1	½	1½
22	28	20	1	25¾	1	½	1½
24	30	20	1	27¾	1	½	1½
26	32	20	1	30	1¼	½	1½
28	34	24	1	32	1¼	½	1½
30	36½	24	1	34½	1¼	⅝	1¾
36	42½	32	1	40½	1½	⅞	1¾

FLANGES EXPANDED AND PIENED ON PIPE.

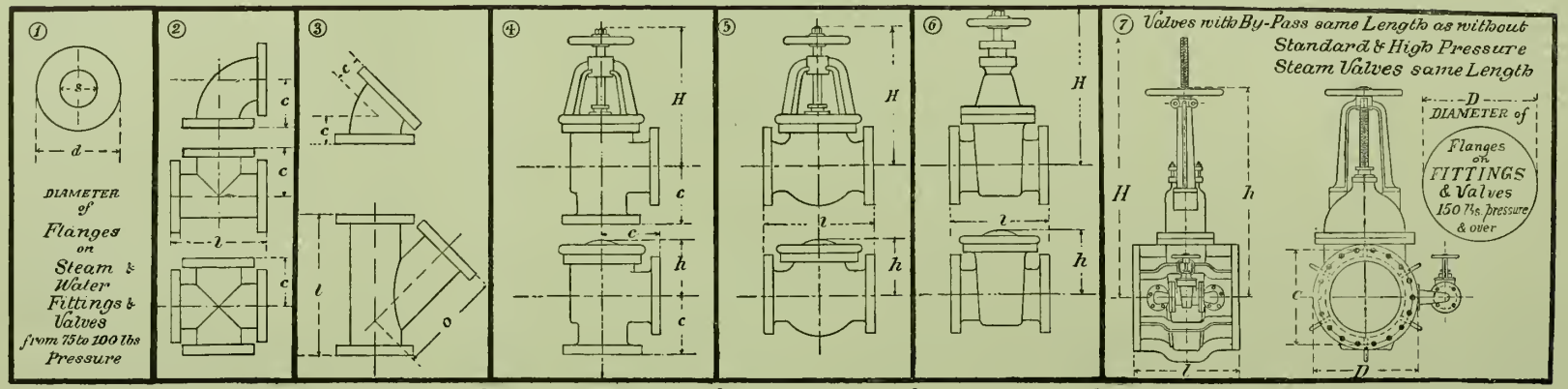
LARGER SIZES TO ORDER.

* STEEL FLANGES ARE NOT **RAISED HOLE.**

BEST, FOX & COMPANY'S

STANDARD DIMENSIONS OF

FLANGED FITTINGS AND VALVES.


1
DIAMETER of Flanges on Steam & Water Fittings & Valves from 75 to 100 lbs Pressure
2
3
4
5
6
7 Valves with By-Pass same Length as without
Standard & High Pressure Steam Valves same Length
DIAMETER of Flanges on FITTINGS & Valves 150 lbs. pressure & over

FLANGES.		ELBOWS, TEES, CROSSES.		45° ELBOWS, Ys			CLIMAX ANGLE VALVES & ANGLE CHECK VALVES.				CLIMAX GLOBE VALVES AND GLOBE CHECK VALVES.			CLIMAX GATE VALVES AND GATE STRAINERS.			BEST'S PATENT GATE VALVES. HEAVY AND EXTRA HEAVY.						
																	DRILLING FOR EX. HY.						
																					HOLES.		
s	d	c	l	c	l	o	SIZE.	c	H	h	l	H	h	l	H	h	SIZE.	l	H	h	D	Number.	Size.	C
2	6	4¾	9½	2½	10⅜	8¾	2	4	10⅜	3½	6½	10¼	4¼	7½	10½	4¼	2	8½	12½	10	6½	4	⅝	5
2½	7	5	10	2⅝	11¼	9½	2½	4½	11¼	3¾	8	11¾	4½	7¾	11¼	4¾	2½	9½	15½	13	7	4	⅝	5½
3	7½	5½	11	2¾	14	11¾	3	5⅛	12½	4	8¾	13½	5¼	8	13	5¾	3	11⅛	19	15	8¾	4	¾	7¼
3½	8	6	12	3	14⅜	12¼	3½	5¼	15⅛	5	10¼	15	6	9	14¼	6	3½	11⅞	21⅜	16¼	9¼	6	¾	7½
4	8½	6¾	13½	3¼	15	12¾	4	6¾	15⅝	5½	11	16½	6¾	9½	15¾	6½	4	12	23¼	17½	9½	6	¾	7¾
5	10	7¾	15½	3¾	17¼	14¾	5	7¼	17½	6½	13	19½	7¾	9¾	18½	8	5	15	31¼	22⅝	11	6	⅞	9¼
6	11	8½	17	4	19	16	6	8	20⅜	7¼	15¼	21¾	9	10	20½	9	6	15⅞	35½	25	12	6	⅞	10¼
7	12	9	18	4¼	21	17¼	7	9½	22¾	8	18	23	9¾	11¼	22½	10	7	16¼	37	27½	13	6	⅞	11¼
8	14	9¾	19½	4½	22	18½	8	10¼	23⅝	9	20	25½	10½	12½	24½	11½	8	16½	42¾	31½	14	8	⅞	12¼
9	15	10½	21	4⅞	23½	19¾	9	11	24⅞	9¼	21	27¼	11¾	13	26½	12½	9	17	46	33⅞	15	8	⅞	13¼
10	16	11¼	22½	5¼	27	22¾	10	11¾	28	9½	23	29¼	13	13¼	27½	13¾	10	18	51¼	37⅝	17½	8	1	15¼
12	18	12½	25	5¾	30	25¼	12	12½	30	12¾	25¾	32	14½	15¼	31	15¾	12	19¾	58⅝	42⅞	19½	12	1	17¼
14	20	14	28	6¼	33¾	28½	14	15	32	14	29¾	35¾	16½	16	35⅝	18¼	14	21½	66½	50	21	12	1	18¾
15	21	15	30	6¾	35½	30	15	15¾	34½	14½	31¾	38	17¾	16½	38¾	19½	15	21½	71¾	53	22	12	1	19¾
16	22	16	32	7¼	37	31¼	16	16¾	36¼	15½	34	40½	19	17¾	41½	21	16	21½	75¼	55½	23½	16	1	21¼
18	25	17	34	7¾	40½	34	18	18½	38¾	17¼	38¼	44	21	19½	45½	23	18	26	85¼	62¾	26	16	1⅛	23¾
20	27	18	36	8	43½	36¾	20	19¾	41	18½	42¼	49½	23⅛	21½	50¼	25¾	20	30	90⅜	66½	28	20	1⅛	25¾
22	29	19	38	8½	47¼	40	22	21	33½	20	46½	52¼	25⅜	23½	55¼	28¼	22	32	98½	73	30	20	1⅛	27¾
24	32	21	42	9¼	50½	42½	24	22¼	46¼	21½	50¾	57½	27⅝	26	60¾	30¾	24	34	107	80¾	32½	24	1⅛	30

DIMENSIONS OF EX. HY. FITTINGS ARE LONGER THAN ABOVE.

FOR EXTREME PRESSURES, FITTINGS AND VALVES ARE MADE OF CHARCOAL IRON, STEEL OR BRONZE.

FITTINGS AND VALVES TO 60 INCH DIAM. TO ORDER.

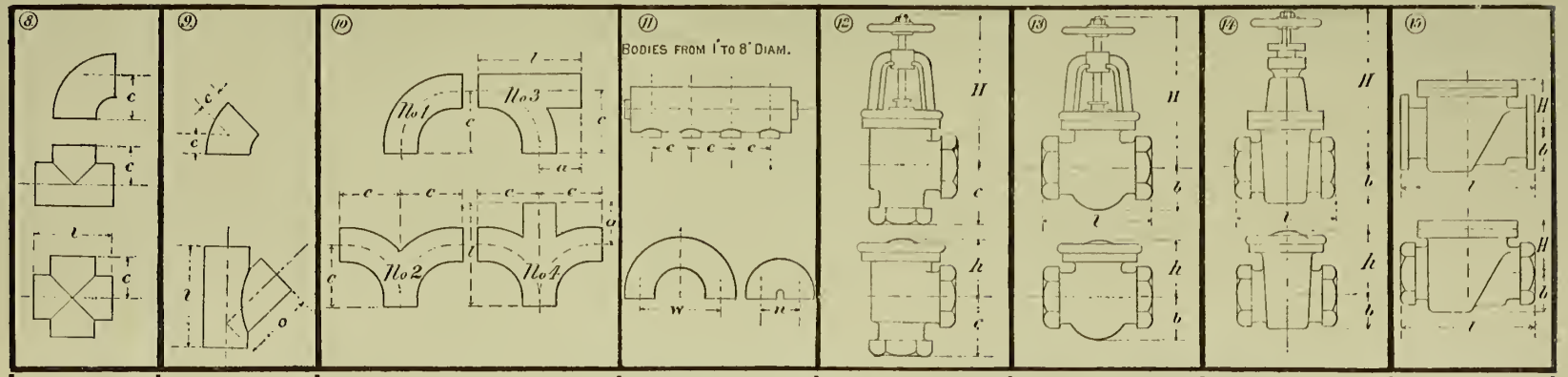
For Measurements of Reduced Fittings See Page 105.

BEST, FOX & COMPANY'S

STANDARD DIMENSIONS OF

SCREWED FITTINGS AND VALVES

FOR MEDIUM AND HEAVY PRESSURES. (NOT EXTRA HEAVY.)



ELBOWS, TEES AND CROSSES.

Size.	c	l
1	1½	3
1¼	1¾	3½
1½	1⅞	3¾
2	2¼	4½
2½	2¾	5½
3	3⅛	6¼
3½	3⅜	6¾
4	3⅞	7¾
4½	4¼	8½
5	4⅜	8¾
6	5	10
7	5¾	11½
8	6⅜	12¾
10	8½	17
12	9⅜	18¾

45° ELBOWS AND Y'S.

c	l	c
1 1/16	3 5/16	2½
1 3/16	3 13/16	2 15/16
1 5/16	4 5/8	3 3/8
1½	5½	4 1/16
1¾	6½	4⅞
2	7¼	5⅝
2 5/16	9¾	7⅛
2½	11 1/16	8 1/16
2¾	11¾	9 1/16
3 1/16	13½	10⅛
3⅜	15⅞	11⅞
3¾	17¼	13
4¾	21⅜	16⅜
5 5/16	25	19

LONG RADIUS.

Size.	c	l	a
1	2⅜	4 1/16	1 11/16
1¼	2¾	4¾	2
1½	3	5 3/16	2 3/16
2	3 5/8	6 1/16	2 7/16
2½	4⅜	7⅝	3
3	5	8¼	3¼
3½	5¾	9 5/16	3 9/16
4	6⅜	10 9/16	4 3/16
4½	7	11¾	4¾
5	7¾	12 9/16	4 13/16
6	9	14 9/16	5 9/16
7	10¼	16 5/16	6 1/16
8	11½	17¾	6¼
10	14	21½	7½
12	15½	25	9½

MANIFOLDS AND RETURN BENDS.

c	w	n
2½	2⅜	1 5/8
3	3⅛	2¼
3½	3¼	2½
4	4	3
5	4⅞	3⅜
6	6¼	4½
6½	6½	5
7	7	5⅝
8	8	6½
9	9	7¼
10	10	8½
11½	11½	9¾
13	13	11
16	16	14
18½	18½	16½

CLIMAX ANGLE AND CHECK VALVES

Size.	c	H	h
1	1½	5	1¾
1¼	2	6	2
1½	2¼	6½	2¼
2	2½	7¾	2½
2½	4½	11¼	3¾
3	5⅛	12½	4
3½	5¼	15¼	5
4	6¾	15¾	5½
4½	7	16¾	6
5	7¼	17½	6½
6	8	20½	7¼
7	9½	22¾	8
8	10¼	23¾	9
10	11¾	28	9½
12	12½	30	12¾

CLIMAX GLOBE AND CHECK VALVES

l	H	h	b
3¼	4½	1½	1¼
4	5½	2	1½
4¼	6	2¼	1¾
5¼	7	2½	2
8	11¾	4½	2⅞
8¾	13½	5¼	3½
10¼	15	6	4
11	16½	6¾	4½
11⅞	17¼	7	5
13	19½	7¾	5½
15¼	21¾	9	6½
18	23	9¾	7⅜
20	25½	10½	8¾
23	29¼	13	10¾
25¾	32	14½	12

CLIMAX GATE VALVES AND STRAINERS.

l	H	h	b
3¼	7¼	2½	1
3½	8¼	3	1¼
3¾	9¼	3½	1½
4½	11	4	1¾
7¾	11¼	4¾	2¼
8	13	5¾	2¾
9	14¼	6	3
9¼	15¾	6½	3½
9½	17	7¼	3¾
9½	18½	8	4
10	20½	9	4¾
11¼	22½	10	5¼
12½	24½	11½	5¾
13¼	27½	13¾	8
15¼	31	15¾	8½

HINGE OR SWING CHECK VALVES.

l	H	b
3½	2½	1
4	2¾	1¼
4¼	3	1¼
5	3½	1½
11½	5¼	3¼
13	5½	3½
13¾	6	3¾
14¼	6½	4¼
14¾	6¾	4¾
16¼	7¼	5
17½	7¾	5½
18½	8½	6
21¾	9½	7
23	10½	8
25¾	11¾	9½

SCREWED FITTINGS TO 15 IN. INSIDE DIAM. ON HAND.

SCREWED **STEEL** FITTINGS TO ORDER.

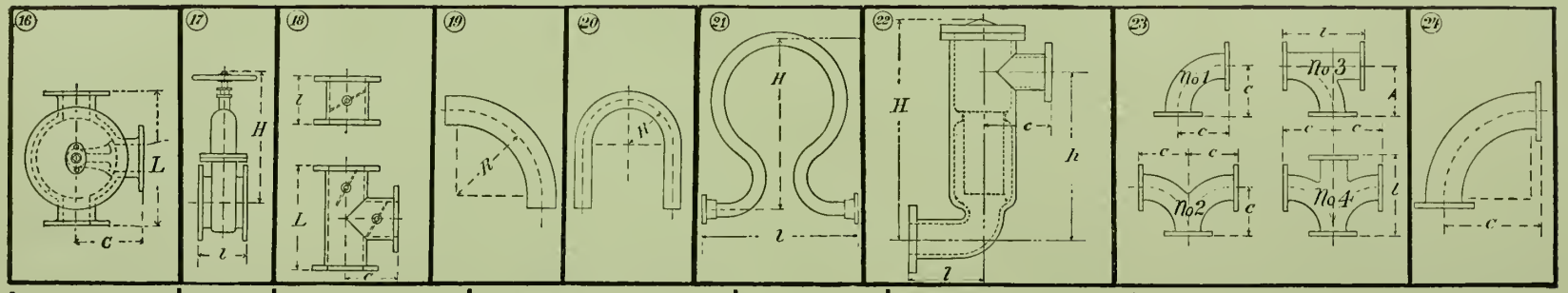
SCREWED **BRASS** FITTINGS TO ORDER.

SPECIAL VALVES FOR HYDRAULIC PRESSURE MADE OF CHARCOAL IRON OR BRONZE.

EXTRA WIDE RETURN BENDS TO ORDER.

DIMENSIONS OF 2 IN. **VALVES** AND SMALLER ARE **BRASS.**

BEST, FOX & COMPANY'S
STANDARD DIMENSIONS
OF
SPECIAL VALVES AND FITTINGS,
ALSO
SMALLEST RADIUS FOR IRON, STEEL AND COPPER BENDS AT WHICH PIPE WILL NOT BUCKLE.



TRANSFER VALVES.

Size.	C	l
4	6½	13
5	7	14
6	7¾	15½
7	8½	17
8	9½	19
10	10½	21
12	12	24
14	13½	27
16	15	30
18	16½	33
20	18	36
22	19¾	39½
24	21	42

LIGHT GATES for EXHAUST AIR, &c.

l	H
5½	12⅝
6	15
7	18
7	19¾
7¼	21¼
7¾	25
8	27¾
9½	32
11¼	36¼
12	41
12½	46½
14	51
15	55

BUTTERFLY VALVES.

Single & Double.			Flag.
l	C	L	Diam.
4½	6½	13	9
5¼	7½	15	10
6	8¾	17½	11¼
7	10¼	20½	12¼
8	11⅝	23¼	14¼
9¾	15	30	17½
10¾	17	34	19
12¼	19¼	38½	21¾
13¾	21	42	23¾
15	23¾	47½	25½
16½	26¼	52½	28
18½	29¼	58½	30½
19¼	31½	63	32½

Measnrements given in Tables 16, 17 and 18 are for *50 lbs. Pressure.*

Full area of sizes of Pipe given is obtained through Butterfly Valves

BUTTERFLY VALVES for HIGH PRESSURE, SPECIAL.

DIAM. of FLANGES on TRANSFER VALVES and LIGHT GATES same as TABLE 25.

MINIMUM RADIUS OF

	SQUARE BENDS.		U BENDS.	
	Iron.	Copper	Iron.	Copper
Size.	R	R	R	R
1″	2″	4	3½	9
1¼	2½	5	4	10
1½	3	5	5	12
2	4	6	6	12
2½	5	6	7	12
3	6½	6	8	15
3½	8	8	10	18
4	10	10	12	20
5	14	15	18	2 ft.
6	18	18	22	2′-6″
7	2′-1″	20	2′-4″	3 ft.
8	2′-8″	2′-6″	3′-6″	3′-4″
10	3′-10″	3′-6″	5′-8″	4′-6″
12	5 ft.	4 ft.	6 ft.	5 ft.
14	6′-2″	4′-6″	7 ft.	6 ft.
16	7′-4″	5 ft.		
18	8′-6″	5 ft.		
20	9′-8″	5′-6″		
22	10′-10″	6 ft.		
24	12 ft.	6 ft.		

PREFER MAKING BENDS (IRON AND COPPER) LONGER RADIUS.

COPPER EXPANSION JOINTS.

Size.	l	H
1	2 ft.	14″
1¼	2′-6″	15
1½	3 ft.	16
2	3 ft.	18
2½	3 ft.	18
3	4 ft.	2 ft.
3½	4′-6″	2′-3″
4	5 ft.	2′-6″
5	6 ft.	3 ft.
6	7 ft.	4 ft.
7	8 ft.	4′-6″
8	10 ft.	5 ft.
10	12 ft.	6 ft.
12	14 ft.	6′-6″
14	16 ft.	7 ft.

PUMP STRAINERS.

Size.	C	l	H	h
6	9½	8½	37¼	26½
7	10¾	9	39¾	27¼
8	10¾	9¾	42	29¾
10	12¼	11¼	49½	35½
12	13¼	12½	54	38¼
14	14¾	14	59¾	42
16	17	16	63	44
18	18	17	68½	48¼
20	19	18	72½	51
22	20	19	77½	54
24	22	21	83½	58

LARGER SIZE STRAINERS AND LONG RADIUS FITTINGS TO ORDER.

LONG RADIUS FLANGED FITTINGS.

Size.	C	l	a
3	5	10⅛	5
3½	5½	11	5½
4	6¼	12⅜	6⅛
5	7½	14⅛	6⅝
6	8¾	16	7¼
7	10	16¾	6⅝
8	11¼	19¾	7⅞
10	13½	21⅞	8⅜
12	15¼	24⅞	9¾
14	17½		
16	20		
18	23		
20	26		
22	29		
24	32		

EXTRA LONG RADIUS ELBOWS.

Size.	C
3	6
3½	7
4	8
5	10
6	12
7	14
8	16
10	20
12	2 ft.
14	2′-4″
16	2′-8″
18	3 ft.
20	3′-4″
22	3′-8″
24	4 ft.

BEST, FOX & COMPANY'S

STANDARD DIMENSIONS OF

REDUCED FLANGED FITTINGS

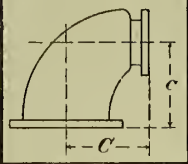
For LIGHT, MEDIUM AND HEAVY PRESSURES, (not EX. HY.)

(25)

DIAMETER of Light Flanges on Fittings & Valves

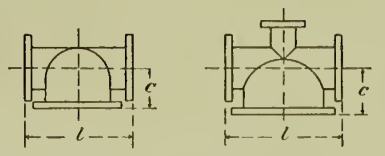
(26)

Any size Reduction Light or Heavy



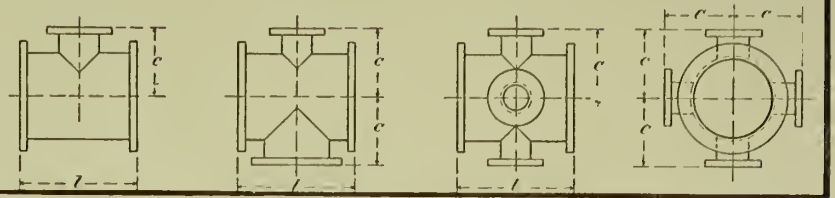
(27)

Any size Reduction



(28)

Any size Reduction Light or Heavy



LIGHT FLANGES.

s	d
2	6
2½	6½
3	7
3½	7½
4	8½
4½	9
5	10
6	11
7	12
8	13
9	15
10	16
12	17
14	19½
15	20½
16	22
18	24
20	26
22	28
24	30

REDUCING ELBOWS.

Size.	C	c
2	7¾	4¾
2½	8½	5
3	9¾	5½
3½	10½	6
4	11¼	6¾
5	13¾	7¾
6	14½	8½
7	16	9
8	17½	9¾
9	18¾	10½
10	20¾	11¼
12	23	12½
14	25¾	14
15	26¾	15
16	29	16
18	32	17
20	34	18
22	35	19
24	38	21

BULL HEAD TEES OR REDUCING ON RUN.

Size.	l	c
2x 3	10½	5
2x 4	12	6¾
3x 5	13½	6¾
3x 6	16	7½
3x 7	17½	7½
4x 6	16	7½
4x 7	17½	8
4x 8	18	8
5x 7	17½	8
5x 8	19	8¾
5x 10	21½	9¼
6x 8	19	8¾
6x 10	21½	9¼
6x 12	23½	9½
7x 10	21½	10¼
7x 12	23½	10¼
7x 14	25½	11¼
8x 10	21½	10¼
8x 12	24½	11½
8x 14	25½	11½
8x 16	28	13¼

Size.	l	c
10x 12	24½	11½
10x 14	26½	13¼
10x 16	28	13¼
10x 18	30½	14¼
10x 20	32	14¼
12x 14	26½	13¼
12x 16	29½	15¼
12x 18	30½	15¼
12x 20	33½	15¼
12x 24	37	15¼
14x 16	29½	15¼
14x 18	34	16½
14x 20	34	16½
14x 24	40	17¼
16x 18	34	16½
16x 20	36	17½
16x 24	40	17½
18x 20	36	17½
18x 24	40	19½

REDUCING TEES AND CROSSES REDUCING ON OUTLET.

Size.	l	c
2½x 1½	10	5
2½x 2	10	5
3 x 1½	10	5¼
3 x 2	10	5¼
3 x 2½	11	5½
3½x 1½	11	5½
3½x 2	11	5½
3½x 2½	11	5½
3½x 3	12	6
4 x 2	12	6
4 x 2½	12	6
4 x 3	13½	6¾
5 x 2	12	6½
5 x 2½	13¼	6¾
5 x 3	13¼	6¾
5 x 4	15½	7¾
6 x 2	13	7
6 x 2½	13	7
6 x 3	14¾	8

Size.	l	c
6 x 4	14¾	8
6 x 5	17	8½
7 x 2	13½	7¾
7 x 2½	13½	7¾
7 x 3	13½	7¾
7 x 4	16	8¾
7 x 5	16	8¾
7 x 6	18	9
8 x 2	13	8½
8 x 3	15	9
8 x 4	15	9
8 x 5	17½	9½
8 x 6	17½	9½
8 x 7	19½	9¾
10x 3	16	10
10x 4	16	10
10x 5	18¼	10¾
10x 6	18¼	10¾
10x 7	20½	10¾
10x 8	20½	10¾

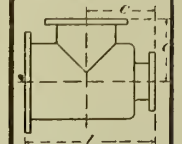
Size.	l	c
12x 3	16½	11
12x 4	16½	11
12x 5	18¾	11¾
12x 6	18¾	11¾
12x 7	19¾	11¾
12x 8	23	12¼
12x 10	23	12¼
14x 4	20	12½
14x 5	20	12½
14x 6	20	12½
14x 7	22¼	12¾
14x 8	22¼	12¾
14x 10	26½	13¼
14x 12	26½	13¼
16x 4	21	13¼
16x 5	21	13¼
16x 6	23	13½
16x 7	23	13½
16x 8	26½	14

Size.	l	c
16x 10	26½	14
16x 12	30½	14¾
16x 14	30½	14¾
18x 4	22¼	14½
18x 5	22¼	14½
18x 6	22¼	14½
18x 7	24½	14½
18x 8	24½	14½
18x 10	28½	15¼
18x 12	28½	15¼
18x 14	32¾	17
18x 16	32¾	17
20x 6	22	15½
20x 8	26½	16
20x 10	26½	16
20x 12	30½	16¾
20x 14	30½	16¾
20x 16	34¾	18
20x 18	34¾	18

Size	l	c
22x 6	24	16½
22x 8	24	16½
22x 10	28½	17¼
22x 12	28½	17¼
22x 14	32½	19
22x 16	32½	19
22x 18	36¾	19
22x 20	36¾	19
24x 6	26	17¾
24x 8	26	17¾
24x 10	30¼	18½
24x 12	30¼	18½
24x 14	34½	20
24x 16	34½	20
24x 18	38¾	20
24x 20	38¾	20
24x 22	38¾	20

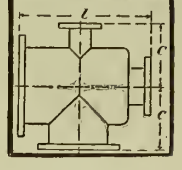
(29)

All Measurements same as Table 2

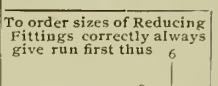


(30)

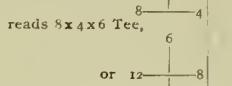
All Measurements same as Table 28



To order sizes of Reducing Fittings correctly always give run first thus



reads 8x4x6 Tee,



or

reads 12x8x10x6 Cross.

ELBOWS WITH SIDE OUTLETS TO ORDER. **STEEL FITTINGS TO ORDER.** **LARGER FITTINGS SPECIAL.**

APPROXIMATE WEIGHT OF BOWL FITTINGS FOR CAST IRON PIPE.

ELBOWS.		45° L^{s}.	TEES.	CROSSES.		SLEEVES.	PLUGS.	REDUCERS.		REDUCING, TEES, CROSSES.		REDUCERS.		REDUCING, TEES, CROSSES.	
Size.	Weight.	Weight.	Weight.	Size.	Weight.	Weight.	Weight.	Size.	Weight.	Weight.	Weight.	Size.	Weight.	Weight.	Weight.
3	34	30	76	3	104	20	5	3X2	35	76	90	14X 6	285	545	570
4	48	65	100	4	150	44	8	4X3	42	90	114	14X 8	340	575	635
6	110	85	150	6	200	65	12	6X4	95	130	150	14X10	430	650	750
8	145	160	265	8	325	86	26	8X4	116	222	265	14X12	475	650	.....
10	225	190	390	10	510	140	46	8X6	126	252	265	16X10	435	890	1010
12	370	290	565	12	700	176	66	10X4	128	292	338	16X12	475	825	1025
14	450	400	700	14	800	208	70	10X6	150	312	388	20X12	540	1025	1370
16	525	510	790	16	1025	340	100	10X8	212	330	415	20X16	690	1115	.....
20	900	740	1375	20	1790	500	150	12X4	230	460	525	24X20	745	.....	2020
24	1400	1425	1875	24	2190	710	185	12X6	230	484	540	30X24	1300	2640	.....
30	.....	2000	3025	30	.....	965	370	12X8	254	492	615	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	12X10	278	510	650	.....	.....	.....	.....

OFFSETS, Ys, CAPS AND SPECIALS OF ALL SIZES AT SHORT NOTICE.

STEEL OR WROUGHT IRON WELDED STEAM, GAS AND WATER PIPE.

TABLE OF STANDARD DIMENSIONS.

Taper of Threads per inch of Screw, $\frac{1}{32}$ inches from $\frac{1}{8}$ to 9 inches, inclusive, and $\frac{1}{64}$ from 10 inches up.

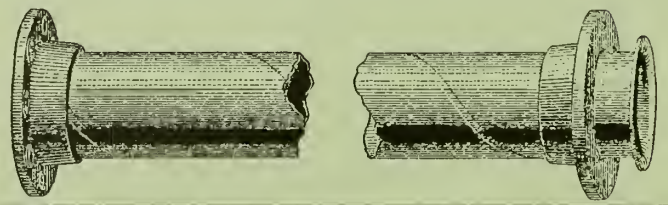
DIAMETER.			THICKNESS.	CIRCUMFERENCE.		TRANSVERSE AREAS.			LENGTH OF PIPE PER SQ. FOOT OF		Length of Pipe, containing One Cubic Foot.	Nominal Weight per Foot.	Number of Threads per Inch of Screw.	Length of Thread.	Nominal Internal Diam.
Nominal Internal.	Actual External.	Actual Internal.		External.	Internal.	External.	Internal.	Metal.	External Surface.	Internal Surface.					
Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Sq. inches.	Sq. inches.	Sq. inches.	Feet.	Feet.	Feet.	Lbs.			
⅛	.40	.27	.068	1.27	.84	.13	.057	071	9.44	14.15	2500.	.24	27	⅜	⅛
¼	.54	.36	.088	1.69	1.14	.23	.104	.125	7.07	10.50	1385.	.42	18	½	¼
⅜	.67	.49	.091	2.12	1.55	.35	.191	.166	5.65	7.67	751.5	.56	"	⅝	⅜
½	.84	.62	.109	2.64	1.95	.55	.304	.249	4 50	6.13	472.4	.84	14	¾	½
¾	1.05	.82	.113	3.39	2.59	.86	.533	.332	3.63	4.63	270.	1.12	"	⅞	¾
1	1.31	1.04	.134	4.13	3.29	1.35	862	.495	2.90	3.67	166.9	1.67	11½	$\frac{15}{16}$	1
1¼	1.66	1.38	.14	5.21	4.33	2.16	1.496	.668	2.30	2.76	96.25	2.24	"	1	1¼
1½	1.9	1.61	.145	5 97	5.06	2.83	2.038	.797	2.01	2.37	70.65	2.68	"	$1\frac{1}{16}$	1½
2	2.37	2.06	.154	7.46	6.49	4.43	3.356	1.074	1.61	1.84	42.36	3.61	"	$1\frac{1}{8}$	2
2½	2.87	2.46	.204	9.03	7.75	6 49	4.784	1.708	1.32	1.54	30.11	5.74	8	$1\frac{3}{16}$	2½
3	3.5	3.06	.217	10 99	9.63	9.62	7.388	2 243	1.09	1.24	19.49	7.54	"	$1\frac{3}{8}$	3
3½	4.	3.54	.226	12.56	11.14	12 56	9.887	2.679	.95	1.07	14.56	9.00	"	"	3½
4	4.5	4.02	.237	14.13	12 64	15.90	12.73	3 174	.84	.94	11.31	10.66	"	$1\frac{7}{16}$	4
4½	5.	4.50	.246	15.70	14.16	19 63	15.961	3.674	.76	.84	9.03	12.34	"	"	4½
5	5.56	5.04	.259	17.47	15.85	24.30	19.99	4.316	.62	.75	7.20	14.50	"	$1\frac{9}{16}$	5
6	6.62	6 06	.28	20.81	19.05	34.47	28.888	5.584	.57	.63	4.98	18.76	"	$1\frac{5}{8}$	6
7	7.62	7.02	301	23.95	22.06	45.66	38 738	6.926	.50	.54	3 72	23.27	"	$1\frac{3}{4}$	7
8	8.62	7.98	.322	27.09	25.07	58.42	50 04	8.386	.44	.47	2.88	28.18	"	$1\frac{7}{8}$	8
9	9.62	8.93	.344	30.23	28.07	72.76	62.73	10.03	.39	.42	2.26	33.70	"	2	9
10	10.75	10.02	.366	33.77	31.47	90.76	78 839	11.924	.35	.38	1.80	40.06	"	$2\frac{1}{8}$	10
11	12.	11.25	.375	37.79	35.34	113 09	99.402	13.696	.32	.34	1.50	45.	"	$2\frac{1}{4}$	11
12	12.75	11.	.375	40.05	37.7	127 67	113.098	14.579	.30	.32	1.27	48.98	"	$2\frac{3}{8}$	12
13	14.	13 25	.375	43.98	41.62	153 93	137.887	16 051	.27	.29	1.04	53.92	"	$2\frac{1}{2}$	13
14	15.	14.25	.375	47.12	44.76	176 71	159 485	17.23	.25	.27	.90	57.89	"	$2\frac{1}{2}$	14
15	16.	15.25	.375	50.26	47.91	201.06	182 655	18.407	.24	.25	.88	62.00	"	$2\frac{5}{8}$	15
17	18.														
19	20.														
21	22.														
23	24.														

These sizes, as well as all sizes above 12 in. can be made of any thickness required. See Table page 112 for dimensions.

PIPE ABOVE 16 IN. OUTSIDE DIAMETER NOT THREADED.

BEST, FOX & CO.

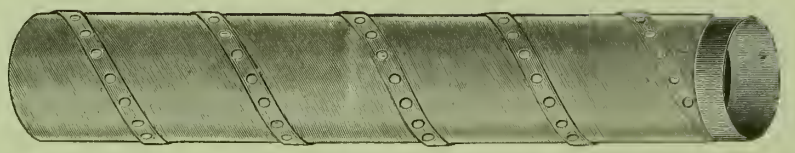
SPIRAL WELD PIPE, WITH SLIP FLANGES.



DIAMETER INSIDE.	GRADE.	NOMINAL WEIGHT, Per ft. Lbs.	PROOF STRENGTH, Per Sq. Inch.
6	Standard	6.86	866
	Heavy	8.07	1106
8	Standard	9.12	650
	Heavy	10.78	830
10	Standard	13.74	664
	Heavy	16.73	872
12	Standard	17.11	553
	Heavy	20.71	727
14	Standard	21.07	474
	Heavy	25.27	623
16	Standard	32.03	545
	Heavy	36.69	670
18	Standard	38.83	484
	Heavy	41.96	596
20	Standard	39.49	436
	Heavy	45.37	536
22	Standard	49.67	396
	Heavy	55.95	487
24	Standard	53.39	363
	Heavy	60.28	446

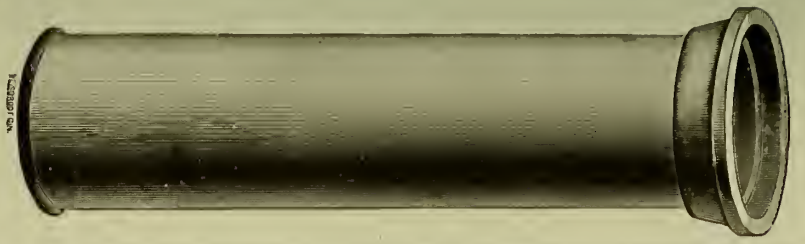
Pipe with Hub and Spigot or Sleeve to order. Descriptive Circular of Spiral Weld Pipe and Connections on Application.

SPIRAL RIVETTED PIPE, WITH RIVETTED FLANGES, DOUBLE GALVANIZED.



INSIDE DIAMETER IN INCHES.	THICKNESS BIRMINGHAM GAUGE.	NOMINAL WEIGHT PER FOOT.
3	No. 20	2¼ lbs.
4	"	3 "
5	"	4 "
6	No. 18	5 "
7	"	6 "
8	"	7 "
9	"	8 "
10	No. 16	11 "
11	"	12 "
12	"	14 "
13	"	15 "
14	No. 14	20 "
15	"	22 "
16	"	24 "
18	"	29 "
20	"	34 "
22	No. 12	40 "
24	"	50 "

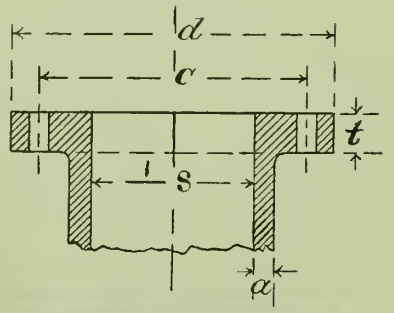
Pipe with Crimped Ends, Sleeve or Slip Joints to order. Descriptive Circular of Spiral Riveted Pipe, Connections and Fittings on Applica ion.

CAST IRON  BOWL PIPE.

GAS PIPE IN 12 FOOT LENGTHS.				WATER PIPE IN 12 FOOT LENGTHS.								
				50 LBS. PER SQUARE INCH. 116 FT. HEAD.			100 LBS. PER SQUARE INCH. 230 FT. HEAD.			200 LBS. PER SQUARE INCH. 300 FT. HEAD.		
Diameter in Inches.	THICKNESS.		Approximate Weight Per Foot.	Thickness.		Approximate Weight Per Foot.	Thickness.		Approximate Weight Per Foot.	Thickness.		Approximate Weight Per Foot.
	Inches.	Approximate Inches.		Inches.	Approximate Inches.		Inches.	Approximate Inches.		Inches.	Approximate Inches.	
3	.31	5/16	11	.385	3/8	14.5	.407	13/32	15	.419	7/16	17
4	.38	3/8	15	.403	13/32	18 5	.431	7/16	21	.448	7/16	22
6	.4	13/32	25	.438	7/16	30	.480	1/2	33	.505	1/2	34
8	.44	7/16	38	.473	1/2	42	.529	17/32	47	.562	9/16	50
10	.44	7/16	50	.508	1/2	55	.578	19/32	63	.619	5/8	67
12	.46	15/32	58	.543	9/16	71	.627	5/8	82	.677	11/16	88
14	.53	17/32	80	.578	19/32	87	.675	11/16	102	.734	3/4	111
16	.56	9/16	100	.617	5/8	108	.728	3/4	127	.794	13/16	137
18	.63	5/8	125	.648	21/32	127	.773	25/32	152	.848	27/32	166
20	.63	5/8	140	.683	11/16	150	.822	27/32	180	.905	29/32	200
24	.72	23/32	185	.753	3/4	196	.920	15/16	240	1.02	1	265
30	.84	27/32	275	.858	7/8	275	1.067	1 1/16	345	1.19	1 3/16	384
36	.95	15/16	375	.963	31/32	370	1.213	1 7/32	470	1.36	1 3/8	527
48	1.04	1	550	1.173	1 3/16	607	1.507	1 1/2	777	1.71	1 11/16	880
60				1.411	1 7/16	910	2.	2	1,328	2.25	2 1/4	1,500

SPECIAL WEIGHTS TO ORDER.

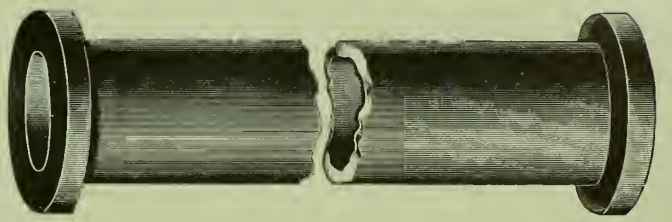
BEST. FOX & CO.



DIMENSIONS OF

CAST IRON FLANGED PIPE,

FOR WATER PRESSURE.



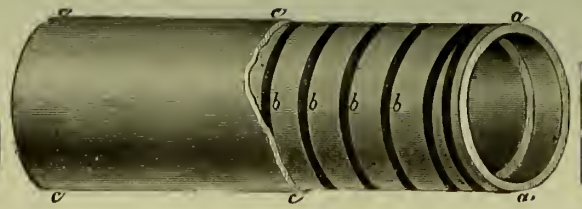
Inside Diam.	Fillet.	Size of Bolts.	No. of Bolts.	P-100 LBS.					P-150 LBS.					P-200 LBS.					P-250 LBS.					P-300 LBS.					Inside Diam.
				a	t	c	d	Wt.	a	t	c	d	Wt.	a	t	c	d	Wt.	a	t	c	d	Wt.	a	t	c	d	Wt.	
4	1/4	5/8	6	1/2	3/4	7	8 1/2	23.4	1/2	3/4	7	8 1/2	23.4	1/2	3/4	7	8 1/2	23.4	1/2	7/8	7	8 1/2	23.6	1/2	1 5/16	7	8 1/2	23.7	4
4 1/2	1/4	5/8	6	1/2	1 3/16	7 1/2	9	26.	1/2	1 3/16	7 1/2	9	26.	1/2	1 3/16	7 1/2	9	26.	1/2	7/8	7 1/2	9	26.1	1/2	1 5/16	7 1/2	9	26.2	4 1/2
5	1/4	5/8	6	1/2	1 3/16	8	10	28.8	1/2	1 3/16	8	10	28.8	1/2	1 3/16	8	10	28.8	1/2	1 5/16	8	10	29.1	1/2	1	8	10	29.3	5
6	1/4	3/4	6	1/2	1 3/16	9 1/4	11	34.	1/2	1 3/16	9 1/4	11	34.	1/2	1 5/16	9 1/4	11	34.3	1/2	1 1/16	9 1/4	11	34.6	1/2	1 3/16	9 1/4	11	34.9	6
7	1/4	3/4	6	9/16	1 5/16	10 3/8	13	45.1	9/16	1 5/16	10 3/8	13	45.1	9/16	1 1/16	10 3/8	13	45.6	9/16	1 3/16	10 3/8	13	46.	9/16	1 1/4	10 3/8	13	46 3	7
8	1/4	3/4	8	5/8	1	11 1/2	14	57.3	5/8	1	11 1/2	14	57.3	5/8	1 1/8	11 1/2	14	57.9	5/8	1 1/4	11 1/2	14	58.4	5/8	1 3/8	11 1/2	14	58.9	8
9	1/4	3/4	8	1 1/16	1	12 5/8	15	69.6	1 1/16	1	12 5/8	15	69.6	1 1/16	1 3/16	12 5/8	15	70.3	1 1/16	1 5/16	12 5/8	15	70.8	1 1/16	1 7/16	12 5/8	15	71.3	9
10	1/4	3/4	10	3/4	1	13 3/4	16	83.6	3/4	1 1/16	13 3/4	16	83.8	3/4	1 1/4	13 3/4	16	84.6	3/4	1 3/8	13 3/4	16	85.2	3/4	1 1/2	13 3/4	16	85.7	10
11	1/4	3/4	10	3/4	1	14 3/4	17	91.2	3/4	1 1/8	14 3/4	17	91.7	3/4	1 5/16	14 3/4	17	92.6	3/4	1 1/2	14 3/4	17	93.4	1 3/16	1 5/8	14 7/8	17	96.9	11
12	1/4	7/8	12	3/4	1	16	19	100.2	3/4	1 1/4	16	19	101.7	3/4	1 7/16	16	19	102.8	3/4	1 5/8	16	19	103.9	7/8	1 3/4	16 1/4	19	121.2	12
13	1/4	7/8	12	3/4	1 1/16	17	20	108.8	3/4	1 5/16	17	20	110.5	3/4	1 1/2	17	20	111.7	1 3/16	1 11/16	17 1/8	20	121.9	1	1 1/16	17 1/2	20	148.8	13
14	1/4	7/8	14	3/4	1 1/8	18	21	116.7	3/4	1 3/8	18	21	118.4	3/4	1 9/16	18	21	119.7	7/8	1 3/4	18 1/4	21	139.5	1 1/16	1 7/8	18 5/8	21	169.7	14
15	1/4	7/8	14	3/4	1 1/8	19	22	124.1	3/4	1 7/16	19	22	126.4	3/4	1 5/8	19	22	127.7	1 5/16	1 13/16	19 3/8	22	160.	1 1/8	1 15/16	19 3/4	22	191.3	15
16	1/4	7/8	16	3/4	1 3/16	20	23	133.	3/4	1 7/16	20	23	134.	1 3/16	1 11/16	20 1/8	23	147.	1	1 7/8	20 1/2	23	180.	1 3/16	2	20 7/8	23	214.	16
18	5/16	1	18	1 3/16	1 3/8	22 1/2	25	164.6	1 3/16	1 11/16	22 1/2	25	167.7	7/8	1 15/16	22 5/8	26	180 6	1 1/8	2 1/8	23 1/8	26	231.3	1 5/16	2 5/16	23 1/2	26	269.2	18
20	5/16	1	20	7/8	1 7/16	24 5/8	28	195.2	7/8	1 3/4	24 5/8	28	198.5	1	2	24 7/8	28	227.4	1 1/4	2 3/16	25 3/8	28	281.7	1 1/2	2 3/8	25 7/8	29	334.5	20
22	5/16	1	22	7/8	1 1/2	26 5/8	30	213.1	7/8	1 13/16	26 5/8	30	216.7	1 1/8	2 1/8	27 1/8	30	278.6	1 3/8	2 5/16	27 5/8	31	342.6	1 5/8	2 1/2	28 1/8	31	406.	22
24	3/8	1 1/8	24	1 5/16	1 11/16	29 1/8	32	250.3	1 5/16	2 1/16	29 1/8	32	254.9	1 3/16	2 5/16	29 5/8	33	325 4	1 1/2	2 9/16	30 1/4	33	406.4	1 13/16	2 13/16	30 7/8	34	468.3	24
26	3/8	1 1/8	26	1	1 3/4	31 1/4	34	288.1	1	2 1/8	31 1/4	34	292 9	1 5/16	2 7/16	31 7/8	35	391.1	1 5/8	2 11/16	32 1/2	36	482.2	1 15/16	2 7/8	33 1/8	36	572.3	26
28	3/8	1 1/8	28	1	1 13/16	33	36	310 1	1 1/16	2 3/16	33 3/8	37	337.5	1 3/8	2 1/2	34	37	433.	1 3/4	2 3/4	34 3/4	38	554.3	2 1/8	3	35 1/2	39	669.3	28
30	1/2	1 1/4	30	1	2	35 3/4	39	338.8	1 1/8	2 7/16	36	39	384.9	1 1/2	2 13/16	36 3/4	40	513 9	1 7/8	3 1/16	37 1/2	41	644 5	2 1/4	3 3/8	38 1/4	42	782.1	30

P-Pressure. *Figures Underlined ___ are greater than obtained by formula.* *Approximate Wt. per ft. in 12 ft. lengths, (Flanges included.)*

LIGHT CAST IRON SOIL PIPE.

SIZE.	Standard, Wt. Per Foot.	Extra Heavy, Wt. Per Foot.
2	3	5½
3	4½	9½
4	6½	13
5	8½	17
6	10	20
8	18	33½
10	25	45
12	30	54

Special Weights and Sizes to Order.



WOOD WATER PIPE STRENGTHENED.

Size Internal.	Size External.	Weight per Foot. Lbs.	Proof Strength, Per Square Inch.
1¼	3½		Grade 1 to stand 160 pounds.
1½	3½		" 2 " 80 "
2	4½		" 3 " 40 "
3	6		
4	7		
5	9		
6	10		
7	9	11	
8	10	13	
10	12	16	
12	14	18	
14	16	20	
16	18	23	

Descriptive Circular on Application.

LIGHT ARTESIAN CASING,

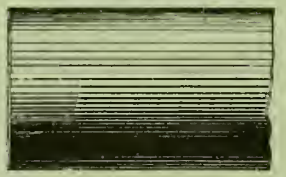
WITH THREAD AND SOCKET.

Nominal Inside Diameter. Inches.	Actual Outside Diameter. Inches.	Nominal Weight per Foot. Pounds.	Number of Threads per Inch of Screw.
2	2¼	2.23	14
2¼	2½	2.75	14
2½	2¾	3 00	14
2¾	3	3.33	14
3	3¼	3.95	14
3¼	3½	4.27	14
3½	3¾	4 60	14
3¾	4	5.33	14
4	4¼	5 50	14
4¼	4½	6.00	14
4½	4¾	6.50	14
4¾	5	7.25	14
5	5¼	7.66	14
5 3/16	5½	8.08	14
5⅝	6	9.35	14
6¼	6⅝	10.06	14
6⅝	7	12.45	14
7¼	7⅝	13 50	14
7⅝	8	15.10	11½
8¼	8⅝	16.15	11½
8⅝	9	17.25	11½
9⅝	10	19 00	11½

Special Sizes to Order.

O. D. (Outside Diam.) LAP WELD PIPE OR BOILER TUBES.

STANDARD SIZES AND DIMENSIONS.



DIMENSIONS NOT GIVEN MADE TO ORDER.

DIAMETER.		THICKNESS.		CIRCUMFERENCE.		TRANSVERSE AREAS.		LENGTH OF PIPE PER SQ. FT. OF SURFACE.		Nominal Weight Per Foot.	External
External. Inches.	Internal. Inches.	Standard Inches.	Nearest Birmingham WIRE GAUGE	External. Inches.	Internal. Inches.	External. Sq. Inches.	Internal. Sq. Inches.	Outside. FEET.	Inside. FEET.	Pounds.	Diameter.
1	0 85	.072	15	3 14	2.68	0.78	0.57	3.81	4.46	.70	1
1¼	1.10	.072	15	3.92	3.47	1.22	0.96	3.05	3.45	.90	1¼
1½	1.33	.083	14	4.71	4.19	1.76	1.39	2.54	2.86	1.24	1½
1¾	1.56	.095	13	5 49	4.90	2.40	1.91	2.18	2.44	1.66	1¾
2	1.80	.095	13	6.28	5.66	3.14	2.55	1.90	2.11	1.91	2
2¼	2 05	.095	13	7.06	6.48	3.97	3.31	1.69	1.85	2.16	2¼
2½	2.28	.109	12	7.85	7.17	4.90	4 09	1.52	1.67	2.75	2½
2¾	2.53	.109	12	8.63	7.95	5 94	5.03	1.39	1 50	3 04	2¾
3	2.78	.109	12	9 42	8.74	7 06	6 08	1.27	1.37	3.33	3
3¼	3.01	.120	11	10 21	9.46	8.29	7.12	1.17	1.26	3.96	3¼
3½	3.26	.120	11	10.99	10.24	9.62	8 35	1.09	1.17	4.28	3½
3¾	3.51	.120	11	11.78	11.03	11.04	9.68	1.01	1.08	4 60	3¾
4	3.74	.134	10	12.56	11 75	12.56	10.99	.95	1.02	5.47	4
4½	4 24	.134	10	14.13	13.32	15.90	14.12	.84	.90	6.17	4¼
5	4 72	.148	9	15 70	14.81	19 63	17.49	.76	.80	7.58	5
6	5.69	.165	8	18.84	17.90	28.27	25.50	.63	.67	10.16	6
7	6.65	.165	8	21.99	20.91	38 48	34.80	.54	.57	11.90	7
8	7.63	.165	8	25 13	23.98	50 26	45.79	.47	.50	13.65	8
9	8.61	.180	7	28.27	27.05	63.61	58.29	.42	.44	16 76	9
10	9 57	.203	6	31.41	30 07	78.54	71.97	.38	.39	21 00	10
11	10.56	.220	5	34.55	33.17	95.03	87.47	.34	.36	25 00	11
12	11.54	.229	4½	37.69	36.26	113.09	103.74	.31	.33	28.50	12
13	12 52	.238	4	40.84	39.34	132 73	123.18	.29	.30	32.06	13
14	13 50	.248	3½	43 98	42.41	153.93	143.18	.27	.28	36.00	14
15	14.48	.259	3	47 12	45 49	176.71	164.71	.25	.26	40.60	15
16	15 45	.270	2½	50 26	48 56	201.06	187.66	.23	.24	45.20	16
17	16.43	.284	2	53 40	51.66	226.98	212.22	.22	.23	49.90	17
18	17 41	.292	1½	56 54	54.71	254 46	238.22	.21	.21	54 81	18
19	18.40	.300	1	59 69	57.80	283.52	265 90	.20	.20	59.47	19
20	19.36	.320	0½	62 83	60 82	314.15	294 37	.19	.19	66.76	20
21	20.32	.340	0	65.97	63.83	346.36	324.31	.18	.18	73.40	21

TUBES TO 30 IN. DIAMETER FURNISHED.

TUBES HEAVIER OR LIGHTER THAN ABOVE MADE TO ORDER.

(X) EXTRA STRONG—STEEL OR WROUGHT-IRON WELDED PIPE.

STANDARD SIZES AND DIMENSIONS. (Dimensions not given Made to Order.)

DIAMETER.			THICKNESS.	CIRCUMFERENCE.		TRANSVERSE AREAS.		LENGTH OF PIPE PER SQ. FOOT OF:		NOMINAL W'T PER FOOT OF LENGTH.	NOMINAL INSIDE DIAM.
Nominal Inside. Inches.	Actual Inside. Inches.	Actual Outside. Inches	Inches.	Internal. Inches.	External. Inches.	External. Sq. inches.	Internal. Sq. inches	Outside Surface. Feet.	Inside Surface. Feet.		
⅛	.20	.40	.10	.64	1.27	.12	.03	9.43	18 63	.29	⅛
¼	.29	.54	.12	.92	1.69	.22	.06	7.07	12 98	.54	¼
⅜	.42	.67	.12	1.32	2.12	.35	.13	5.65	9 07	.74	⅜
½	.54	.84	.14	1 70	2 63	.55	.23	4 54	7 04	1 09	½
¾	.73	1.05	.15	2 31	3 29	.86	.45	3.63	5 10	1 53	¾
1	.95	1.31	.18	2.98	4.13	1.35	.71	2.90	4 01	2.17	1
1¼	1.27	1.66	.19	3.99	5 21	2.16	1 27	2.30	3 00	3 00	1¼
1½	1.49	1.9	.20	4.69	5.96	2 83	1.75	2.01	2 55	3 63	1½
2	1.93	2.37	.22	6 07	7.46	4 43	2 93	1.60	1 97	5 02	2
2½	2.31	2.87	.28	7.27	9 03	6 49	4.20	1.32	1.64	7.67	2½
3	2.89	3.50	.30	9.08	10.99	9.62	6.56	1	1.32	10 25	3
3½	3.35	4 00	.32	10.54	12.56	12.56	8.85	.95	1.13	12 47	3½
4	3 81	4.50	.34	11.99	14.13	15.90	11.44	.84	1.00	14.97	4
4½	4 25	5.00	.35	13 35	15.71	19.63	14.18	.76	90	17.60	4½
5	4.81	5 56	.37	15.12	17.47	24.30	18.19	.68	79	20.54	5
6	5.75	6.62	.43	18 06	20.81	34.47	25 93	.57	66	28 58	6
7	6.62	7.62	.50	20 81	23.95	45.66	34.47	.50	58	37.60	7
8	7.50	8.62	.56	23 56	27.10	58.42	44.18	.44	.51	47.85	8

(XX) DOUBLE EXTRA STRONG STEEL OR WROUGHT-IRON WELDED PIPE.

⅜	.23		.22	.73			.04		15.69	.96	⅜
½	.24		.29	.76			.04		15.66	1.5	½
¾	.42		.31	1.32			.13		9.04	2.3	¾
1	.58		.36	1.84			.27		6.51	3 4	1
1¼	.88		.38	2 78			.61		4.51	5	1¼
1½	1.08		.40	3.41			.93		3 51	6.45	1½
2	1.49		.44	4 68			1.74		2 56	9 48	2
2½	1.75		.56	5.51			2.41		2.17	13.3	2½
3	2.28		.60	7.17			4.09		1 67	17 7	3
3½	2.71		.64	8.53			5.79		1 4	22	3½
4	3.13		.68	9 85			7.72		1.21	24.7	4
4½	3.56		.72	11.2			9.96		1 05	32 45	4½
5	4.06		.75	12.76			12.96		.94	37.1	5
6	5.06		.78	15.89			20 1		.78	50.1	6
7	5.98		.82	18.83			28.16		.62	60 34	7
8	6 88		.87	21.61			37.17		.56	71 52	8

SAME AS EXTRA HEAVY.

SPECIAL HYDRAULIC PIPE TO ORDER.

BEST, FOX & CO.

BRASS AND COPPER PIPE. (Seamless Drawn.)

IRON PIPE SIZES.

Iron Pipe. Size.	Inside Diameter.	Outside Diameter.	Approximate Weight Per Foot.	
			BRASS.	COPPER.
1/8	.27	13/32	.30	.31
1/4	.36	9/16	.43	.45
3/8	.49	11/16	.58	.61
1/2	.62	13/16	.8	.84
3/4	.82	1 1/16	1.17	1.23
1	1.04	1 5/16	1.67	1.75
1 1/4	1 38	1 5/8	2.42	2.54
1 1/2	1.61	1 7/8	2.92	3.
2	2.06	2 3/8	4.17	4.38
2 1/2	2.46	2 7/8	5.	5.25
3	3.06	3 1/2	8.	8.4
3 1/2	3.5	4	10.	10.5
4	4.	4 1/2	12.	12.6
5	5.	5 9/16	15.9	17.3
6	6.	6 5/8	20.7	22.4
7	7.	7 5/8	26.3	27.8
8	8.	8 5/8	29.9	33.7

SPECIAL LIGHT BRASS AND COPPER PIPE FURNISHED FROM STOCK AS REQUIRED.

EXTRA HEAVY TO ORDER.

LEAD PIPE.

APPROXIMATE WEIGHT PER FOOT, LBS. AND OZ.

Size.	Aqueduct.	Extra Light.	Light.	Medium.	Strong.	Extra Strong.	Double Ex. Strong.
1/4	...	..	.6	...	.8	.12	....
3/8	.8	...	.12	1.	1.4	1.8	....
1/2	.10	.12	1.	1.4	1.12	2.8	3.
5/8	.12	1.4	1.12	2.	2.8	3.	3 8
3/4	1.	1.8	2.	2.4	3.	3.8	4.
1	1 8	2.	2.8	3.4	4.	4.12	5.8
1 1/4	2.	2.8	3.	3.12	4.12	6.	6.12
1 1/2	3.	3.8	4.	5.	6.	7.8	9.
2	...	4.	5.	7.	8.	9.	10.8

LARGER SIZES TO ORDER.

SHEET LEAD, BRASS AND COPPER.

APPROXIMATE WEIGHT PER SQUARE FOOT.

Thickness.	LEAD.	BRASS.	COPPER.
3/64	3	2.	2.1
1/16	4	2.8	3.
5/64	5	3 5	3.7
3/32	6	3.9	4.2
1/8	8	5.5	5.8
3/16	12	7.8	8.3
1/4	16	11.	12.
3/8	24	16.	17.
1/4	32	20.	21.

SPECIAL THICKNESS TO ORDER.

We will not attempt to give a list of the Mills, Steel Works, Factories, Electric Light Plants, Etc., fitted complete for STEAM, WATER, GAS, OIL and HYDRAULIC purposes, in all parts of the United States: but only refer to a few

HIGH-PRESSURE POWER PLANTS

for Traction Roads fitted by us.

ALLEGHENY TRACTION CO..	Allegheny, Pa.
CENTRAL TRACTION CO., ...	Pittsburg, Pa.
DUQUESNE TRACTION CO., ...	" "
ELECTRIC TRACTION CO., ... Two Power Houses.	Philadelphia, Pa.
FAIRHAVEN & WESTVILLE R. R. CO., . . .	New Haven, Conn.
HESTONVILLE, MANTUA & FAIRMOUNT R. R. CO.,	Philadelphia, Pa.
NASSAU ELECTRIC R. R. CO., ...	Brooklyn, N. Y.
PHILADELPHIA TRACTION CO.. . . . . Three Power Houses.	Philadelphia, Pa.
PITTSBURGH, ALLEGHENY & MANCHESTER TRACTION CO., ...	Allegheny, Pa.
PLEASANT VALLEY PASS. RAILWAY, . . .	" "
WORCESTER TRACTION CO., ...	Worcester, Mass.
BROOKLYN CITY ELECTRIC RAILWAY, . .	Brooklyn, N. Y.

Main Steam Lines from 8 inch to 20 inch bent by us for this plant.
" " Line STEEL FITTINGS machined by us for this plant.

PLANS, SPECIFICATIONS and ESTIMATES submitted for

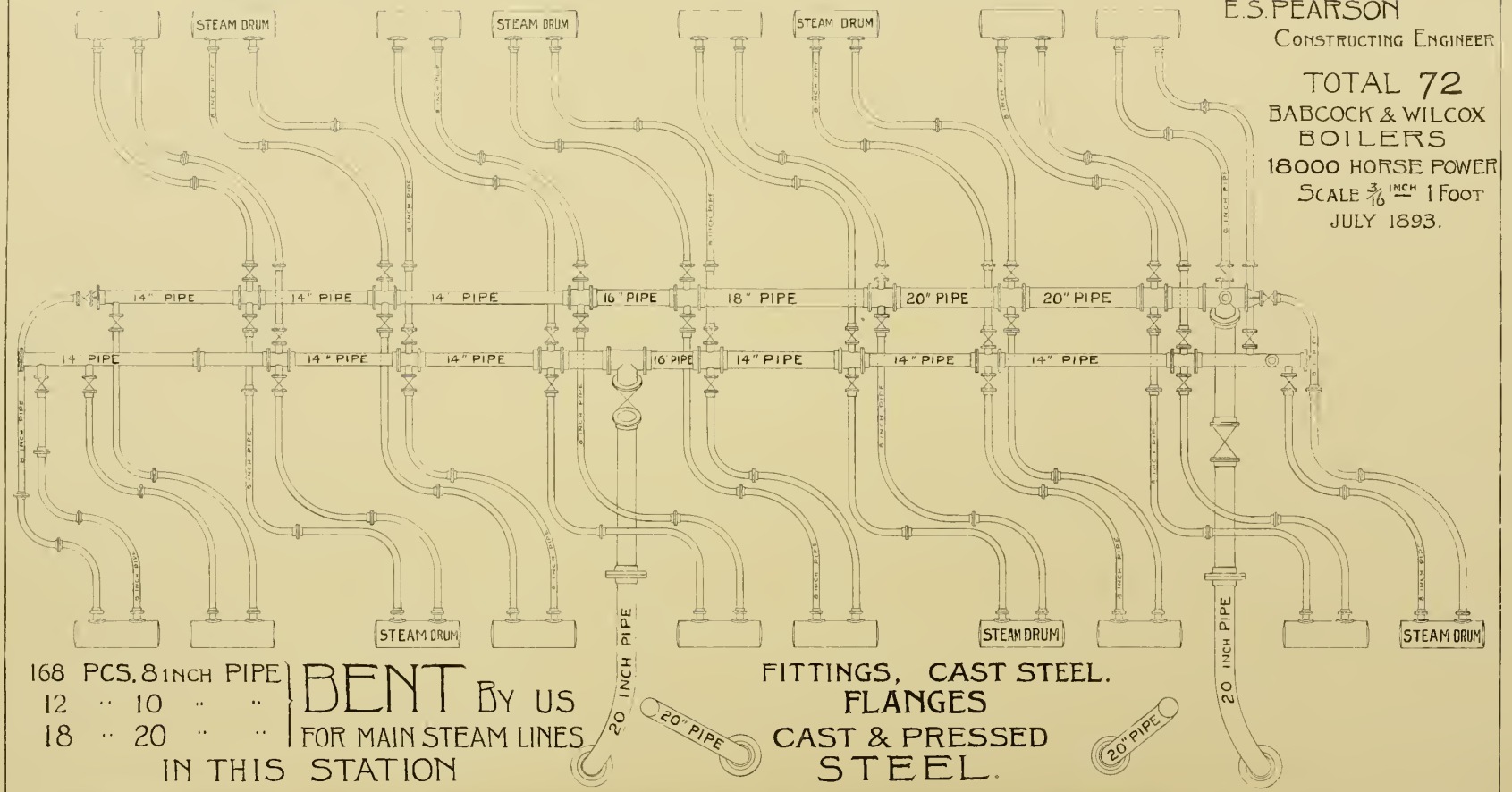
High and Low Pressure Steam, Exhaust and Condenser Piping

For complete or any part of Power Plants.

We also cut, bend and fit pipe of all sizes to drawings and guarantee correctness of our work.

OVER

PLAN OF MAIN STEAM LINES IN LOWER FLOOR (UPPER FLOOR DUPLICATE) OF BOILER HOUSE EASTERN STATION
BROOKLYN CITY RAILWAY COMPANY, BROOKLYN, N. Y.



E.S. PEARSON
CONSTRUCTING ENGINEER

TOTAL 72
BABCOCK & WILCOX
BOILERS
18000 HORSE POWER
SCALE 3/16 INCH 1 FOOT
JULY 1893.

168 PCS. 8 INCH PIPE
12 " 10 " "
18 " 20 " "
} BENT BY US FOR MAIN STEAM LINES IN THIS STATION

FITTINGS, CAST STEEL.
FLANGES
CAST & PRESSED
STEEL.

LARGEST POWER HOUSE IN THE WORLD.

BEST, FOX & CO.

POWER HOUSE
OF THE
BROOKLYN CITY ELECTRIC RAILWAY CO.,
BROOKLYN, N. Y.

On the opposite page a plan of the main steam lines (on one floor) of the largest power house in the world is shown.

By means of the long 8-inch **S** Bends running from drums to duplicate mains ample provision is made to take up all the expansion and contraction running with main lines and at right angles to same. The 20 inch mains drop to basement by means of bends of peculiar shape, then run under engine room floor and up to respective cylinders with 10 inch bends. By referring to cut at the top of this page the 30° bend in each 8 inch pipe where it connects into main trunk is shown, insuring condensation returning to boilers by gravity.

All fittings and flanges are heavy cast steel, precluding any possibility of breakage ever taking place.

MONONGAHELA FURNACES, McKEESPORT, PA.

(DEPARTMENT OF NATIONAL TUBE WORKS.)

Designed by and erected under the supervision of FRANK C. ROBERTS, C. E., PHILADELPHIA, PA.

ERECTED 1889-90.

JOHN B. MILES, C. E.,
Resident Engineer.

On the opposite page a view is given of the

Monongahela Furnaces at McKeesport, Pa.,

Erected in 1889-90 for the National Tube Works Co. The photo was taken from the west side of the Monongahela River.

These furnaces were designed by, and erected under the supervision of, Frank C. Roberts, C. E., of Philadelphia, Pa.

No. 1 was put in blast Dec. 1st, 1890; No. 2 June 1st, 1891.

Dimensions of each furnace: 80 ft. high, 20 ft. diameter of Bosh.

Stove Equipment: 7 Cowper-Kennedy, each 79½ ft. high, 21 ft. diameter.

Blast is furnished by five Reynolds Improved Corliss Engines, made by the E. P. Allis Co., Milwaukee, Wis.: 42 inch Steam Cylinder, 84 inch Air Cylinder, 60 inch stroke.

Boiler equipment consists of 32 Boilers, 54 inch diameter, 30 feet long, two 18 inch flues.

Two Duplex Barr Pumps outside packed plungers, placed in dry well, take water from the river through 16 inch pipe, discharging through 12 inch pipe into reservoir.

Three Duplex Barr Pumps outside packed plungers, in basement of engine house, take water from reservoir through 18 inch pipe, discharging through two 12 inch pipes into two tanks 20 x 18 feet, located between engine and boiler house; also by-passed into two 12 inch lines running to furnaces and stoves.

Two Duplex Barr Pumps outside packed plungers, in basement of engine house, take water from reservoir through the above 18 inch pipe, discharging through two 5 inch lines to heaters and boilers, and by-passed to feed direct.

Six Berryman Heaters, one for each blowing engine and one for pumps are installed in the engine room.

See pages 120 and 121 for Bosh, Steam and Water Piping.

Annual Capacity of both furnaces 180,000 Net Tons.

OVER

SHOWING BOSH FITTING, STYLE K.

MONONGAHELA FURNACE BOSH,

Designed and erected under the supervision of FRANK C. ROBERTS, C. E., PHILADELPHIA, PA.

JOHN B. MILES, C. E.,
Resident Engineer.

On the opposite page a view is given of one of the

Monongahela Furnace Boshes

just before going into blast.

Thickness of bosh walls is 31½ inches; protected with five rows of Climax Bronze Bosh Plates (Kennedy's Patent), seven Tuyere Coolers, one Bronze Notch Cooler with Intermediate Cooler and Cinder Notch, and seven 7-inch Tuyeres are used.

Dam Plate made in two parts is used, and a 1½-in. spray pipe is placed on top of rivetted hearth jacket.

Provision is also made to spray furnace lining above mantel.

Main circular supply pipe is 9 inches in diameter. Waste trough 10 x 12 inches.

The I. and K. system of Bosh fitting is used. Six 4-inch Manifolds are connected to circular supply pipe, and 1¼-inch connections taken from same to respective water-cooled devices.

1¼-inch No. 10 Tuyere cocks and brass Unions are used throughout. This style of bosh fitting gives easy access to every stop cock, and makes a neat and symmetrical system of bosh piping. (See cut.)

Steam provided by the thirty-two boilers is conveyed from each battery of two boilers, through 8-inch copper bends into two main lines, beginning with 10 inches and increasing to 14 inches; both connecting into a common 13-inch header in engine room, with 8-inch copper bend to each engine and 6-inch branch line to pumps in basement and dry well.

12-inch exhaust from each engine is brought to its respective heater; and exhaust from three circulating and two boiler feed pumps is connected together and taken into one heater. Exhaust is taken from the six heaters into a trunk line increasing from 12 to 30 inches, thence into atmosphere.

Steam, exhaust and water connections are by-passed, providing for all possible emergencies. Washouts are not only placed on the tanks and reservoir, but all large mains are provided with Wash-out Valves at lowest points.

For all large steam, exhaust and water lines on the entire plant O. D. (outside diameter) pipe, from 8 to 18 inches, inclusive, is used, with flanges shrunk and pieced on.

From 80 to 100 lbs. steam is carried.

The COMPLETE STEAM AND WATER FITTING

has been done by us at the following FURNACE PLANTS:

ASHLAND IRON & STEEL CO.,	Ashland, Wis.	
BUFFALO FURNACE CO.,	Buffalo, N. Y.	
DECATUR FURNACE CO.,	Decatur, Ala.	
DE BARDELEBEN COAL AND IRON CO.,	Bessemer, Ala.	2 Furnaces.
DULUTH BLAST FURNACE CO.,	Duluth, Minn.	
FORT PAYNE FURNACE CO.,	Fort Payne, Ala.	
LADY ENSLEY FURNACE CO.,	Sheffield, Ala.	
MONONGAHELA FURNACE CO.,	McKeesport, Pa	2 Furnaces.
NASHVILLE IRON, STEEL AND CHARCOAL CO.,	Nashville, Tenn.	2 Furnaces
OREGON IRON AND STEEL CO.,	Oswego, Oregon.	
POWELLS, ROBT. HARE SONS & CO.,	Saxton, Pa.	
PULASKI DEVELOPMENT CO.,	Pulaski, Va.	
ROSENA FURNACE CO.,	New Castle, Pa.	
SALEM FURNACE CO.,	Salem, Va.	
SHEFFIELD FURNACE CO.,	Sheffield, Ala.	
SHEFFIELD & BIRMINGHAM COAL, IRON & R. W. CO.,	" "	3 Furnaces.
SLOSS IRON AND STEEL CO.,	Birmingham, Ala.	2 Furnaces.
VALENTINE ORE LAND ASSOCIATION,	Bellefont, Pa.	
VANDERBILT IRON AND STEEL CO.,	Birmingham, Ala.	
WATTS IRON AND STEEL SYNDICATE,	Middlesboro, Ky.	2 Furnaces.
WOODSTOCK IRON CO.,	Anniston, Ala.	2 Furnaces.

PLANS, SPECIFICATIONS and ESTIMATES submitted for STEAM EXHAUST and WATER PIPING COMPLETE for FURNACE PLANTS.

We have erected complete the water piping for the following

BLAST FURNACE BOSHES:

ÆTNA IRON CO.,	Aetna, Tenn.	
ASHLAND IRON AND STEEL CO.,	Ashland, Wis.	
BELLAIRE NAIL WORKS,	Bellaire, O.	(Copper Pipe.)
BRIER HILL IRON AND STEEL CO.,	Brier Hill, O.	
BUFFALO FURNACE CO.,	Buffalo, N. Y.	
CARRIE FURNACE CO.,	Rankin, Pa.	2 Boshes.
CHERRY VALLEY IRON CO.,	Leetonia, O.	
CHICAGO FURNACE CO.,	South Chicago, Ill.	
CLIFTON IRON CO.,	Ironaton, Ala.	
CORNWALL IRON CO.,	Cornwall, Pa.	2 Boshes. (Galvanized Pipe.)
DECATUR FURNACE CO.,	Decatur, Ala.	
DEBARDEBEN COAL AND IRON CO.,	Bessemer, Ala.	2 Boshes.
DULUTH BLAST FURNACE CO.,	Duluth, Minn.	
FORT PAYNE FURNACE CO.,	Fort Payne, Ala.	
GADSDEN-ALABAMA FURNACE CO.,	Gadsden, Ala.	
HAINSWORTH STEEL CO.,	Allegheny, Pa.	
JEFFERSON IRON WORKS,	Steubenville, O.	
JUNCTION IRON CO.,	Mingo Junction, O.	
JUNIATA MINING AND MANUFACTURING CO.,	Newport, Pa.	
KING, GILBERT & WARNER CO.,	Columbus, O.	
KING, GILBERT & WARNER CO.,	Moxahala, O.	
LADY ENSLEY FURNACE CO.,	Sheffield, Ala.	
MINERVA FURNACE CO.,	Milwaukee, Wis.	
MONONGAHELA FURNACE CO.,	McKeesport, Pa.	2 Boshes.
NASHVILLE IRON, STEEL AND CHARCOAL CO.,	Nashville, Tenn.	2 Boshes.
NORTH CORNWALL FURNACE,	North Cornwall, Pa.	(Galvanized Pipe.)
OREGON IRON AND STEEL CO.,	Oswego, Ore.	
POUGHKEEPSIE IRON CO.,	Poughkeepsie, N. Y.	(Copper Pipe.)
POWELLS, ROBT. HARE, SONS & CO.,	Saxton, Pa.	
PULASKI DEVELOPMENT CO.,	Pulaski, Va.	

OVER.

Furnace Bosh Fitting Continued.

RIVERSIDE IRON WORKS,	Wheeling, W. Va.	
ROANOKE IRON CO.,	Roanoke, Va.	
ROBESONIA IRON CO.,	Robesonia, Pa.	
ROME IRON CO.,	Rome, Ga.	
ROSENA FURNACE CO.,	New Castle, Pa.	
SALEM FURNACE CO.,	Salem, Va.	
SALEM IRON CO.,	Leetonia, O.	2 Boshes.
SHEFFIELD FURNACE CO.,	Sheffield, Ala.	
SHEFFIELD AND BIRMINGHAM COAL, IRON & R. W. CO.,	Sheffield, Ala.	3 Boshes.
SHENANGO VALLEY STEEL CO.,	New Castle, Pa.	(Copper Pipe.)
SLOSS IRON AND STEEL CO.,	Birmingham, Ala.	2 Boshes.
UNION ROLLING MILL CO.,	Cleveland, O.	
VALENTINE ORE LAND ASSOCIATION,	Bellefont, Pa.	
VANDERBILT IRON AND STEEL CO.,	Birmingham, Ala.	
VIRGINIA IRON AND R. W. CO.,	Goshen, Va.	
WATTS IRON AND STEEL SYNDICATE,	Middlesboro, Ky.	2 Boshes.
WOODSTOCK IRON CO.,	Anniston, Ala.	2 Boshes.
YORK IRON CO.,	Black River Falls, Wis.	

PLANS, SPECIFICATIONS and ESTIMATES submitted for complete Bosh Fitting of Iron, Galvanized, Brass or Copper Pipe, or we will furnish all pipe cut and bent to exact requirements according to drawings or sketches furnished or to our measurements, with full instructions for erection when customers wish to do their own fitting.

PLANS AND SPECIFICATIONS

SUBMITTED FOR

PIPE WORK OF ANY DESCRIPTION.

HIGH PRESSURE STEAM.

TESTED TO 300 LBS. PRESSURE.

HYDRAULIC PIPING,

FROM 500 TO 3000 LBS. PRESSURE.

AMMONIA AND BRINE,
COMPRESSED AIR,
HYDRAULIC ELEVATOR,

} PIPING

TESTED TO

500 LBS. PRESSURE

EXHAUST, CONDENSER, ECONOMIZER
PIPING, ETC., ETC.

WE GUARANTEE

AMPLE SIZES AND STRENGTH OF ALL MATERIALS

AMPLE PROVISION FOR EXPANSION AND CONTRACTION BRACING AND STAYING AND AUTOMATIC DRAINING.

ALSO PROVIDE VALVES AND BY-PASSES IN ALL IMPORTANT LINES, TO KEEP PLANTS IN CONSTANT OPERATION

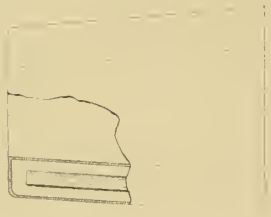
SATISFACTION GUARANTEED

IN EVERY PARTICULAR, AT MINIMUM FIRST COST, AND
MINIMUM DAILY COST OF OPERATION.

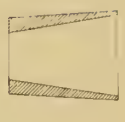
FOR

BLAST FURNACE SPECIALTIES

REVERSE THE BOOK.



TUYERE WITH PIPE INSIDE.



REDUCING NOZZLES.

We make Reducing Nozzles to suit Tuyeres of any size of Climax Bronze.

NOTE.

FIRST. All Tuyeres, Coolers, Bosh Plates and Boxes should always have their discharge on TOP in every instance. No air can possibly remain in them if this is observed.

SECOND. It is not material at what point Supply is connected to the Tuyere; it is important, however, that this Supply should be connected into the opening having plug with projecting square which has pipe inside for the purpose of conveying Feed Water to nose. (See sketch.) This pipe is found in all Tuyeres and Coolers 12 in. long and over.

THIRD. Tuyeres and Coolers burned at the nose, or outside as large as 2 in. square we can often repair and make practically as good as new. Furnace men can repair small holes in bronze castings at the Furnace with annealed Copper Rod that can be threaded and screwed into said holes, and in addition to the tapping, this Copper can be pieced to assist in making the casting tight. This Copper Rod we can furnish of any size, also Taps and Dies to cut threads. We also carry in stock Brass Counter Sunk Plugs that are often used for closing drill holes in bronze castings.

FOURTH. How to detect leaky Tuyeres. The metal joint between the Tuyere and Cooler will if there is any leak in the Tuyere, or at the nose of the Cooler, draw the moisture to the heel or butt of the Tuyere; moisture only indicates a slight leak; blue trickling water means that leaky casting should be promptly removed. The old way of detecting leaky Tuyeres was at casting time, to draw the gas through the stoves, insert rod in Tuyeres, and the leaky one could be detected by the moisture on the rod.

FIFTH. How to detect leaky Plates with water under pressure. If the leak is a serious one, both gas and steam will show with the discharge water. If the leak is slight, slack the water supply to Plates under suspicion, turn discharge pipe down below level of these Plates, hold lighted lamp at discharge water, and if any Plate in the group leaks, it will develop by gas igniting; if this does not occur, it can be depended upon that no Plate in said group leaks; (it being understood that blast is meantime constantly on the Furnace). To detect which Plate in the group leaks, make temporary connections to one Plate at a time by means of emergency hose and coupling connections, that each furnace should have two or three of. In case no spare Plates are on hand, the leaky one can remain in the Furnace without fear of damage as long as discharge pipe is kept below the level of leaky Plate, and the water pressure no greater than the blast pressure.

How to prevent frequent loss of Tuyeres by drilling. Remove Tuyere in question; ram clay in the opening the Tuyere came out of; then shove Tuyere into same, but do not blow through it for an hour, and the molten steam will then have found a new current.

How to force the blast across the Hearth when required in emergencies. Plug a Tuyere solid with good furnace clay, drive a tapered wooden plug through same, of the size wanted, and you have a reduced Tuyere that will last several hours before the clay is gone.

N. B.—We are at the service of our friends for such information as we can and will cheerfully give. Don't hesitate to ask.

WE MAKE

WATER AND AIR COOLED DEVICES

OF ANY CONSTRUCTION OF

CLIMAX BRONZE

FOR

SILVER,
COPPER,
GLASS,
STEEL
AND IRON

SMELTING FURNACES.

CORRESPONDENCE SOLICITED.

FOR

PIPE,
FITTINGS,
VALVES,

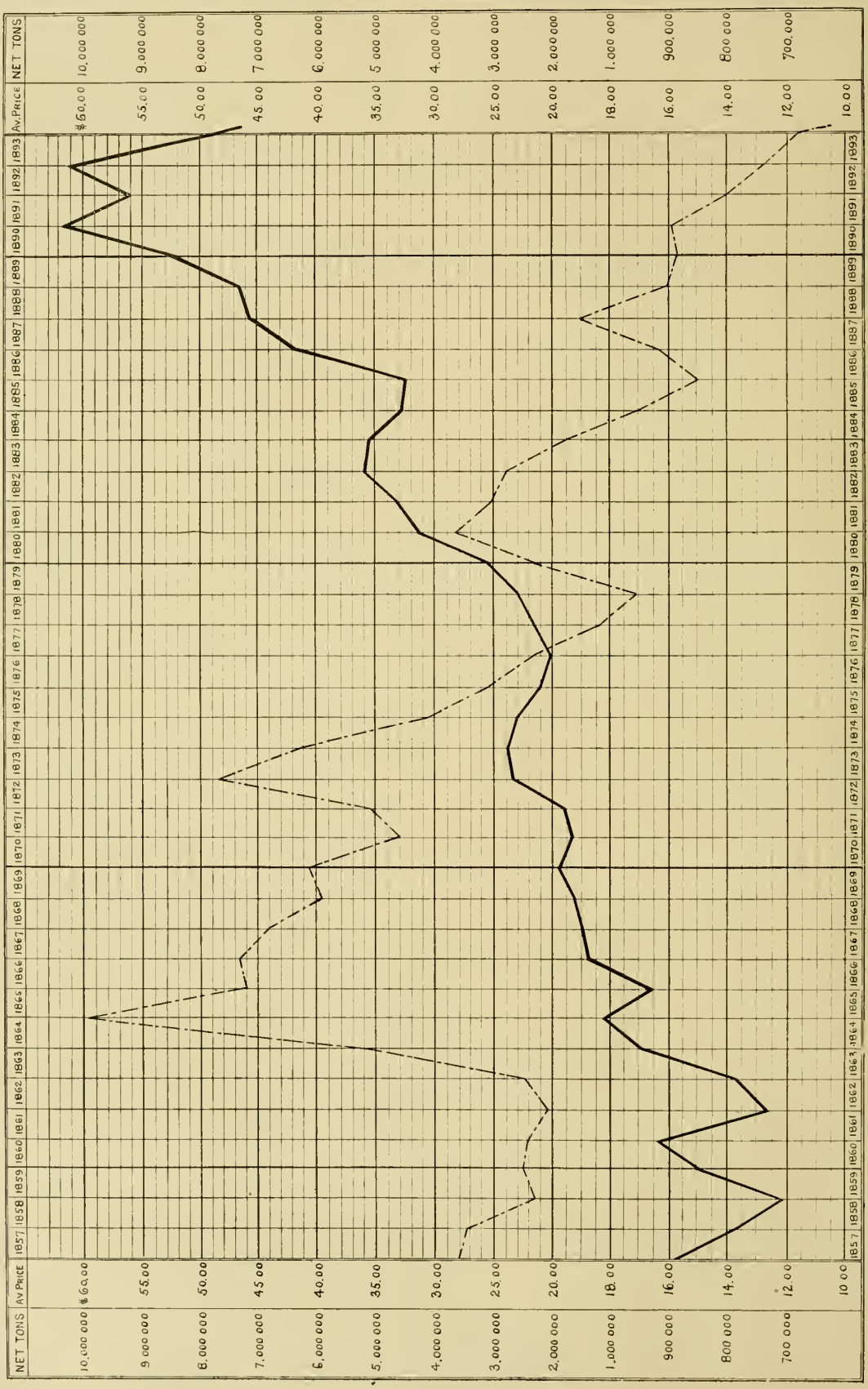
AND SPECIALTIES OF ANY DESCRIPTION

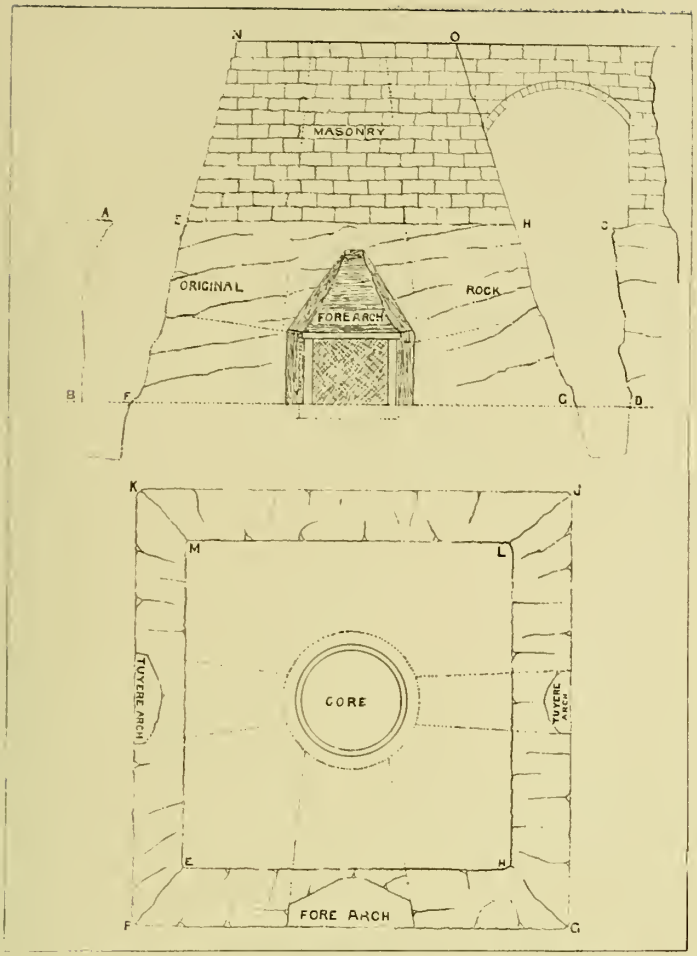
REQUIRED TO CONVEY

STEAM, WATER, GAS, OIL, AIR, ETC., ETC.

REVERSE THE BOOK.

SCALE SHOWING VARIATION IN PRICES AND PRODUCTION OF PIG IRON IN THE UNITED STATES FROM 1857 TO 1893.





ONE OF THE BLAST FURNACES IN USE IN THE "FIFTIES."

Above cut represents OLIVE FURNACE, Lawrence County, Ohio.

Size, 10x40, built in 1846. Annual Capacity, 4,500 Tons.

Total production of Pig Iron in the United States in 1846 about 200,000 tons or the equivalent of the capacity of two of the present 20 ft. (bosh) furnaces. 2,280 of these small furnaces would be required to make the product of 1892 in the United States—10,255,000 tons, 102 of the modern 20 ft. (bosh) furnaces similar to those shown on pages 105, 107, 110 and 112 can make entire product of 1892. 253 furnaces were in blast that year. Total number of furnaces in the United States in 1892, 574. Mined in the United States in 1892,——

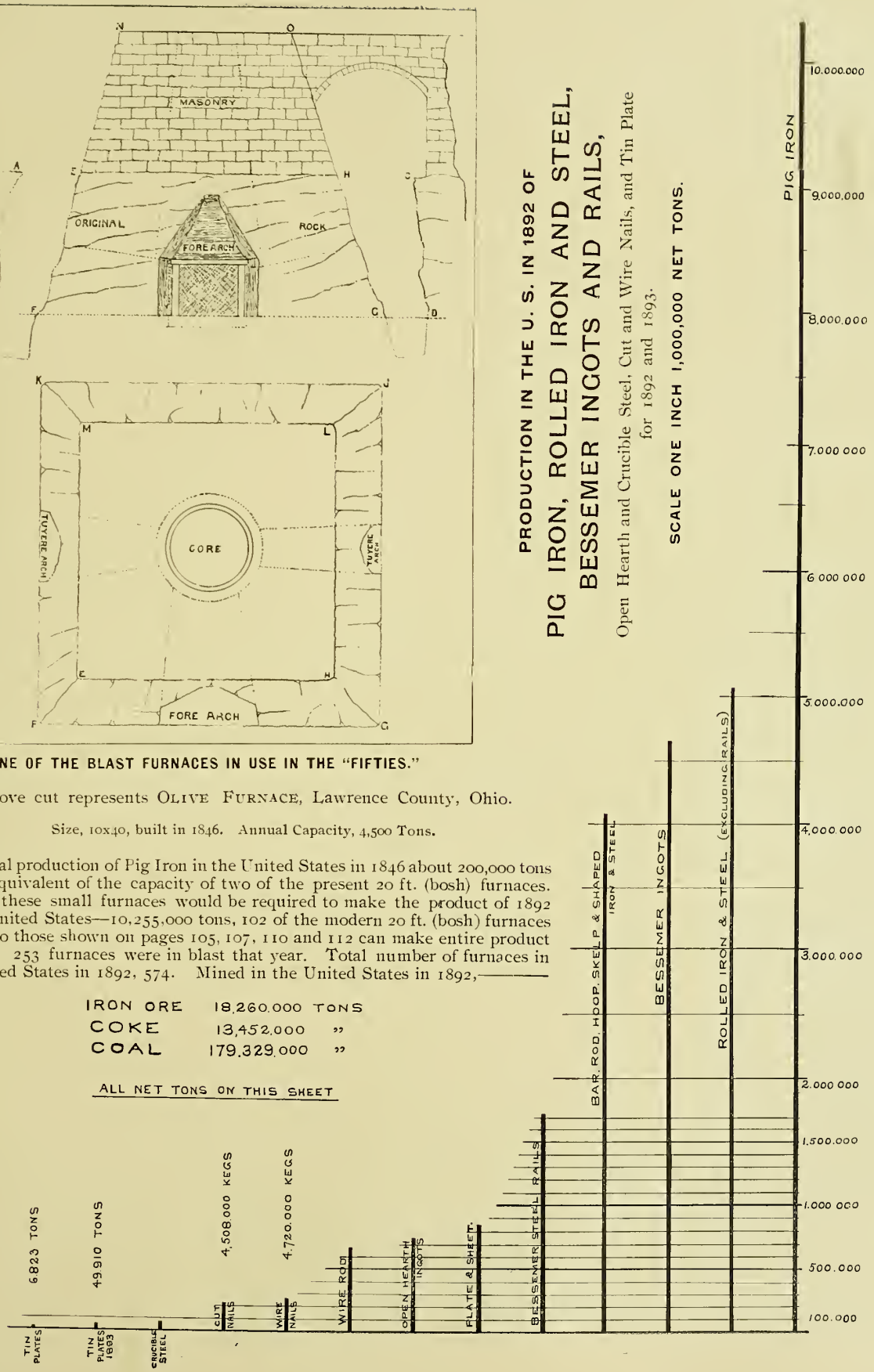
IRON ORE	18,260,000 TONS
COKE	13,452,000 "
COAL	179,329,000 "

ALL NET TONS ON THIS SHEET

PRODUCTION IN THE U. S. IN 1892 OF PIG IRON, ROLLED IRON AND STEEL, BESSEMER INGOTS AND RAILS,

Open Hearth and Crucible Steel, Cut and Wire Nails, and Tin Plate for 1892 and 1893.

SCALE ONE INCH 1,000,000 NET TONS.



BOSH COOLING PLATES OR BOXES

MADE OF CLIMAX BRONZE HAVE BEEN

Furnished by us to the following Furnaces:

ANDREWS BROS. CO.,	Hazleton, Ohio.	
ATLANTIC IRON AND STEEL CO.,	New Castle, Pa.	
BELLAIRE NAIL WORKS,	Bellaire, Ohio.	
BRIER HILL IRON AND COAL CO.,	Brier Hill, Ohio.	
BRISTOL IRON AND STEEL CO.,	Bristol, Va.	
BUFFALO FURNACE CO.,	Buffalo, N. Y.	
CARBON IRON AND STEEL CO.,	Parryville, Pa.	
CAMBRIA IRON CO.,	Johnstown, Pa.	6 Furnaces.
CARNEGIE STEEL CO.,	Bessemer, Pa.	9 "
CARNEGIE STEEL CO.,	Pittsburg, Pa.	2 "
CARRIE FURNACE CO.,	Rankin, Pa.	2 "
CHARLOTTE FURNACE CO.,	Scottdale, Pa.	
CHERRY VALLEY IRON WORKS,	Leetonia, Ohio	
CLEVELAND ROLLING MILL CO.,	Cleveland, Ohio.	3 Furnaces.
CLINTON IRON AND STEEL CO.,	Pittsburgh. Pa.	
COLEBROOK FURNACE,	Lebanon, Pa.	
COOK, D. S.,	Glen Wilton, Va.	
CORNWALL IRON CO.,	Cornwall, Pa.	2 Furnaces.
GIRARD IRON CO.,	Girard, Ohio.	
GRAHAM FURNACE CO.,	Graham, Va.	
HAINSWORTH STEEL CO.,	Allegheny, Pa.	
ILLINOIS STEEL CO.,	Joliet, Ills.	2 Furnaces.
IRIQUOIS FURNACE CO.,	South Chicago, Ills.	
ISABELLA FURNACE CO.,	Etna, Pa.	3 Furnaces.
ISABELLA FURNACE CO.,	Wyebrook, Pa.	
JEFFERSON IRON WORKS,	Steubenville, Ohio.	
JUNCTION IRON CO.,	Mingo Junction, Ohio.	
KING, GILBERT & WARNER CO.,	Columbus, Ohio.	
KING, GILBERT & WARNER CO.,	Moxahala, Ohio,	
MARYLAND STEEL CO.,	Sparrows Point, Md.	4 Furnaces.
MAHONING VALLEY IRON CO.,	Youngstown, Ohio.	
MONONGAHELA FURNACE CO.,	McKeesport, Pa.	2 Furnaces.
NORTH CORNWALL FURNACE.,	North Cornwall, Pa.	

FURNACES USING BRONZE BOSH COOLING DEVICES

CONTINUED.

PALMER SHIP BUILDING CO.,	Jarrow, England.	
PENNA. STEEL CO.,	Steelton, Pa.	4 Furnaces.
PIERCE, KELLY & Co.,	Sharpsville, Pa.	
POUGHKEEPSIE IRON CO.,	Poughkeepsie, N. Y.	
POTTSTOWN IRON CO.,	Pottstown, Pa.	
PULASKI IRON CO.,	Pulaski, Va.	
RADFORD-CRANE IRON CO.,	Radford, Va.	
READING IRON CO.,	Temple, Pa.	
ROANE IRON CO.,	Rockwood, Tenn.	
ROSENA FURNACE CO.,	New Castle, Pa.	
SALEM IRON CO.,	Leetonia, Ohio.	
SHENANGO VALLEY STEEL CO.,	New Castle, Pa.	
SHARON IRON CO.,	Sharon, Pa.	
SHOENBERGER & CO.,	Pittsburg, Pa.	2 Furnaces.
SPATHITE IRON CO.,	Florence, Ala.	
STICKNEY IRON CO.,	Baltimore, Md.	
THOMAS FURNACE CO.,	Niles, Ohio.	
THROPP, JOS E.,	Everett, Pa.	
UNION ROLLING MILL CO.,	Cleveland, Ohio.	
VIRGINIA IRON AND R. W. CO.,	Goshen, Va.	
WARWICK IRON CO.,	Pottstown, Pa.	
YOUNGSTOWN STEEL CO.,	Youngstown, Ohio.	

Plans in Detail with Specifications and Estimates

submitted for any style of Bosh-Cooling. **Satisfaction Guaranteed.**

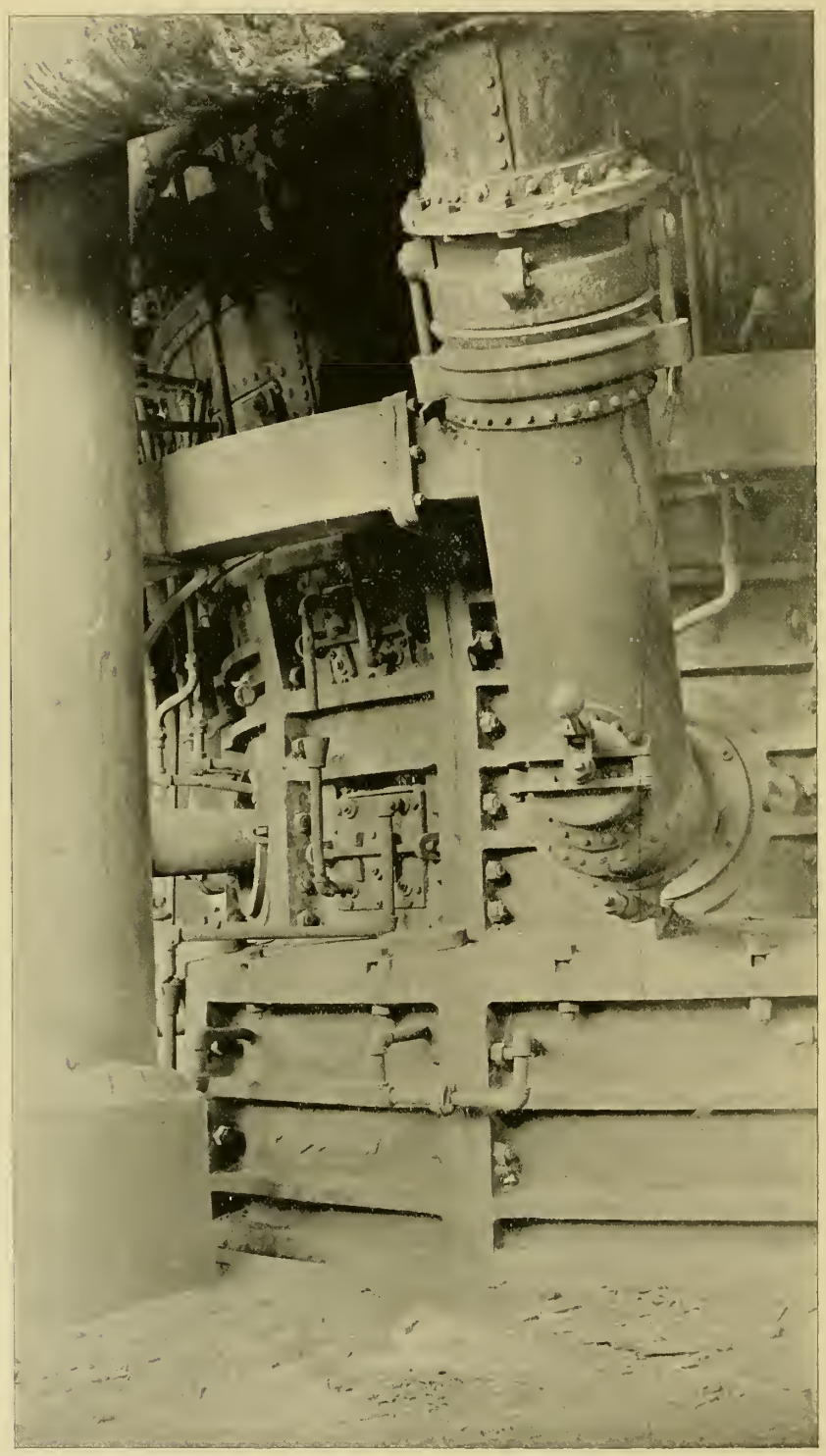
Reverse the book and see pages 122, 123, 124 for Furnaces and Boshes fitted by us.

We will not attempt to enumerate the furnaces using our **Climax Bronze Tuyeres, Coolers, Notches, Valves, Seats, etc.,** but will only say that we have over eight hundred patterns to satisfy the demand coming from all parts of the world.

WE KEEP IN STOCK CONSTANTLY

500 Tuyeres,
200 Notches,
40 Coolers and Notch Coolers,
Assortment of Plates, Boxes and Seats.

PROMPT SHIPMENT THEREBY ASSURED.



BASE OF ONE OF THE CAMBRIA IRON CO.'S FURNACES, JOHNSTOWN, PA.

CAMBRIA IRON COMPANY,

JOHNSTOWN, PA.

This Company has six Furnaces, four of which were originally built in 1853-54.

Nos. 1 and 2, each 76 ft. x 16 ft., were rebuilt in 1883.
Nos. 2 and 3, each 76 ft. x 16 ft., were rebuilt in 1886.
No. 5, 76 ft. x 19 ft. was built in 1876.
No. 6, 76 ft. x 19 ft. was built in 1879.

Twenty Whitwell Stoves are used in connection with same. Annual capacity 350,000 tons.

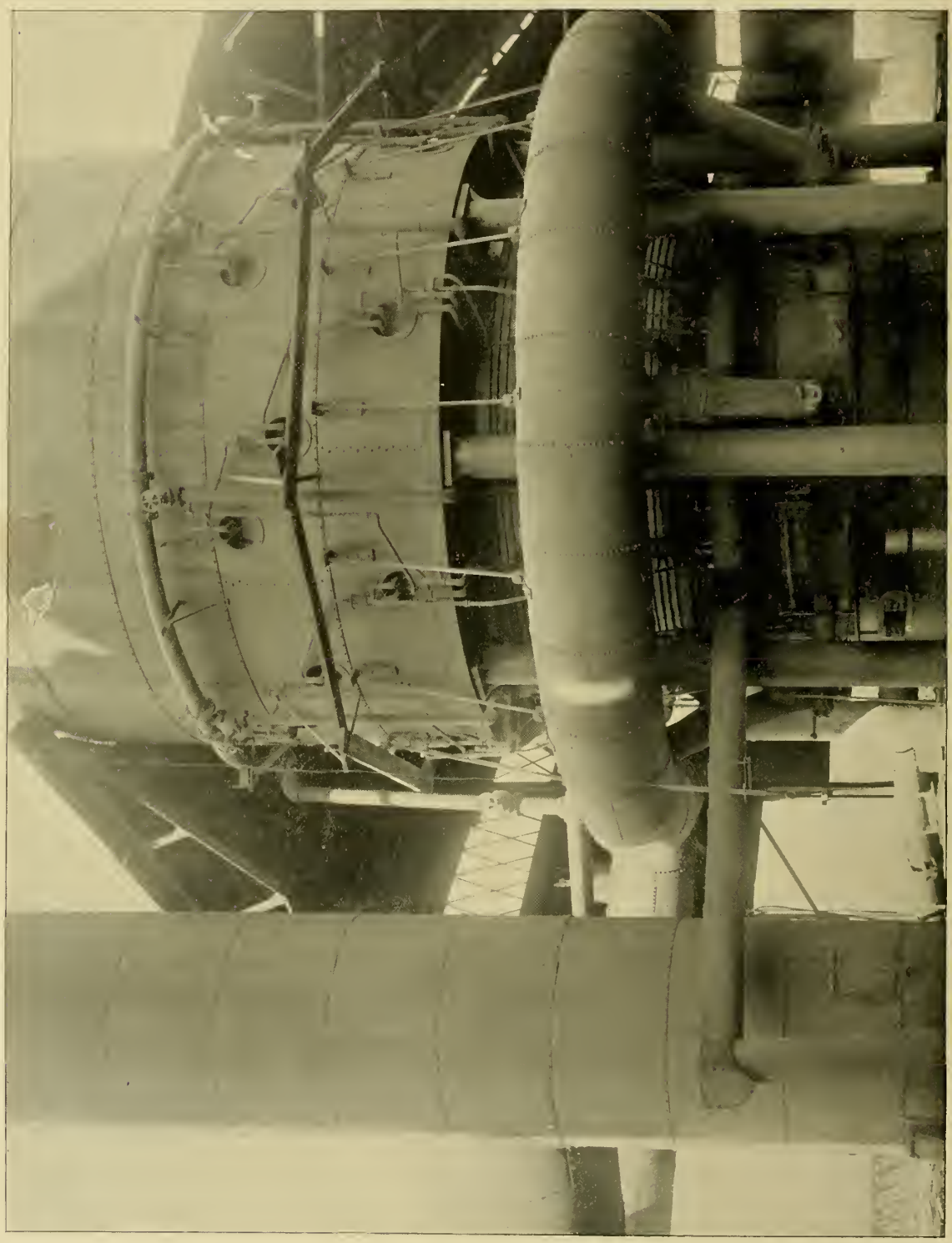
All these furnaces are equipped with "Fronheiser's Patent Bosh Boxes," removable, and with water not under pressure, and this cooling device has been in use for fifteen years, giving entire satisfaction.

Until the year 1887, the bosh walls were made 27 in. thick and boxes 22 in. long used with same. Owing to the excellent condition of boshes being preserved by the boxes, (furnaces having given out above same), it was decided to reduce the walls to 22 in. This thickness of wall has been in use seven years, giving satisfactory results. Owing to the thinner walls, increased diameter of bosh and hearth has been obtained with corresponding increase of product, and at the same time a decrease in the cost of material and labor entering into the construction of the bosh.

The base of furnace shown on opposite side is one of four, having cast iron jacket at bottom and steel riveted jacket around bosh. The remaining two furnaces use no steel jacket, bands only being used above tuyeres. The L system of Bosh fitting is used.

Very few boxes are lost as the hand-hole plate in the back of boxes gives access to the inside of box for thorough cleaning.

For full description of **Fronheiser's Bosh Box,** see pages 70, 71, 72 and 73.



BOSH OF GRACE FURNACE NO. 2. BRIER HILL IRON AND COAL CO., YOUNGSTOWN, OHIO.

GRACE FURNACE, No. 2,

OF THE

BRIER HILL IRON AND COAL COMPANY,

YOUNGSTOWN, OHIO.

On the opposite page a view of the lower part of this Furnace is given. Eight rows of Pollock's Patent Bosh Plates made of Climax Bronze are used to protect the bosh walls, three rows of which are placed above the mantel as shown. This gives effectual cooling to the greatest bosh diameter, and insures no cutting above mantel which is so often the case where cooling plates come no higher than the mantel.

The K. & M. style of fitting is used on this bosh. See cut. An 8 in. wrot. iron circular coil with eight 8x4 Flanged Tees is placed about 18 in. above topmost row of plates. Next to each of these Tees a 4 in. Gate Valve is placed so as to control each large drop feed independent of the main circular pipe. 1¼ in. holes are tapped directly into the circular pipe to feed the three upper rows, which is accomplished by the water dropping into open funnel on supply inlet of top row, and overflowing to row below, and this in turn overflowing into third row, then wasting into trough.

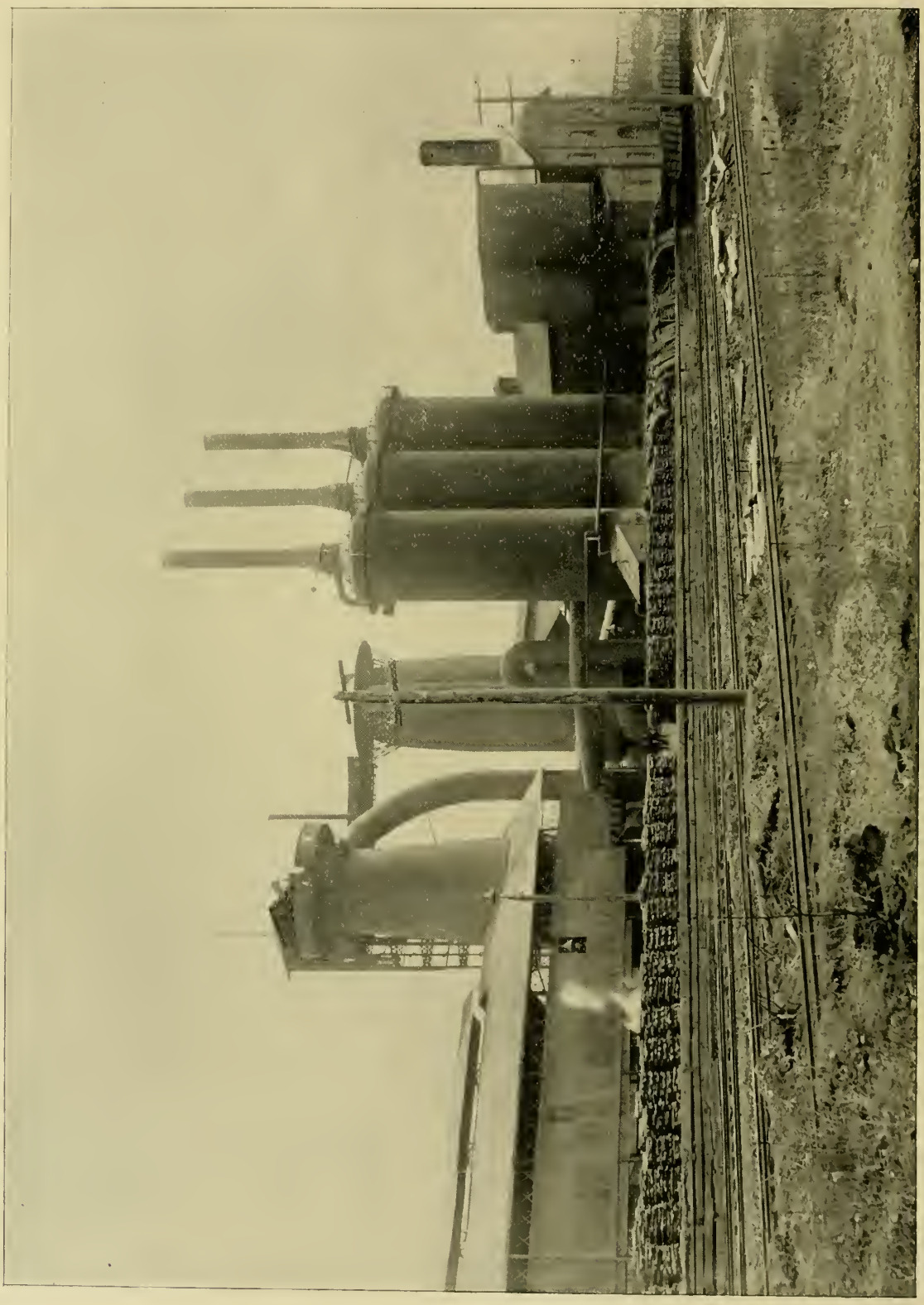
The rows below mantel obtain their supply from 1¼ in. pipes tapped into 4 in. drops which feed into open funnels and overflowing into lower rows similar to connections above mantel, except waste from lowest plate is connected to spray pipe, and by means of Three-way Tuyere Cock is carried to the bottom of furnace direct when sprinkling is not desired.

Plates are cleaned thoroughly by forcing heavy hose connected with boiler feed pumps into the open funnels which stirs up all sediment, and which is carried off through waste pipe.

Tuyeres, Coolers, Notch and Notch Coolers are supplied from a separate circular pipe inside of columns, the bustle pipe hiding the same from view.

No plate has been lost from the time furnace went into blast to the time of this writing, Nov. 1, 1894, or forty-one months.

Full description of **Pollock's Patent Plate** is given on pages 74, 75, 76 and 77.



GRACE FURNACE NO. 2. BRIER HILL IRON AND COAL CO., YOUNGSTOWN, OHIO.

GRACE FURNACE, No. 2,

OF THE

BRIER HILL IRON & COAL COMPANY.

YOUNGSTOWN, OHIO.

On the opposite side a general view of the above furnace is given. This furnace was completed June 1st, 1891, and was put in blast six days later. Its dimensions are 77 feet high, 18 feet 9 in. diameter of bosh, 10 feet well, 13 feet 6 in. at stock line.

Stove equipment consists of 4—19 feet 6 in. by 65 feet Massicks & Crooke's Stoves, built by McClure & Amsler, Pittsburg, Pa.

Blast is furnished by two Robinson-Rea engines, 36 in. by 54 in. by 84 in., and one Wm. Tod & Co. engine, 42 in. by 48 in. by 84 in.

Steam power is furnished by 14 Two-flue Boilers, 50 in. by 30 feet each. Six 6 inch Tuyeres are used.

Total output from June 7th, 1891, to April 1st, 1893, 22 months, 143,340 Tons. Largest month's output, 7890 Tons. Largest day's output, 282½ Tons.

Ran on Bessemer from Aug. 26, 1892, to Jan'y 31, 1893, without a cast of No. 3 Iron and Coke under 2000 lbs. 790 Casts in all, and an average output for this time of 240 Tons per day.

Average Temperatnre, 1200 degrees, and a very uniform pressure of 7 to 8 lbs. on 2800 cubic feet blast.

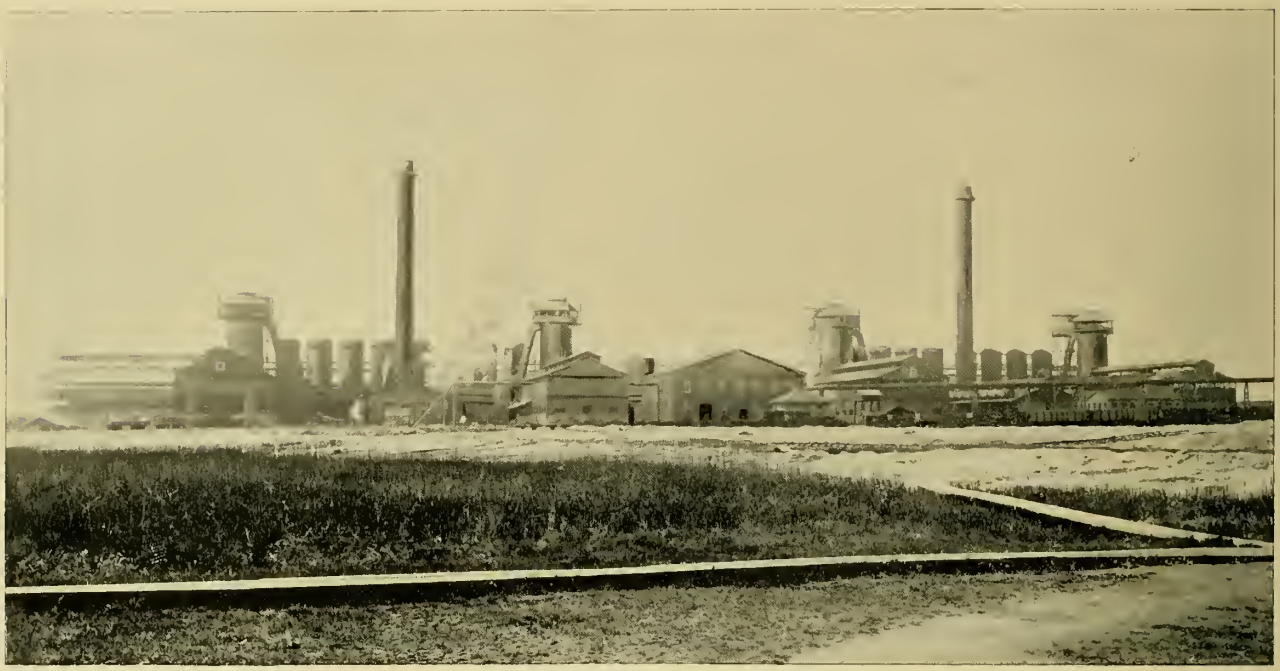
Furnace at this date is apparently in as good shape as the day it was blown in, and is doing as good work now as any time during blast. As yet have not lost a single cooling plate.

R. C. STEESE, Supt.

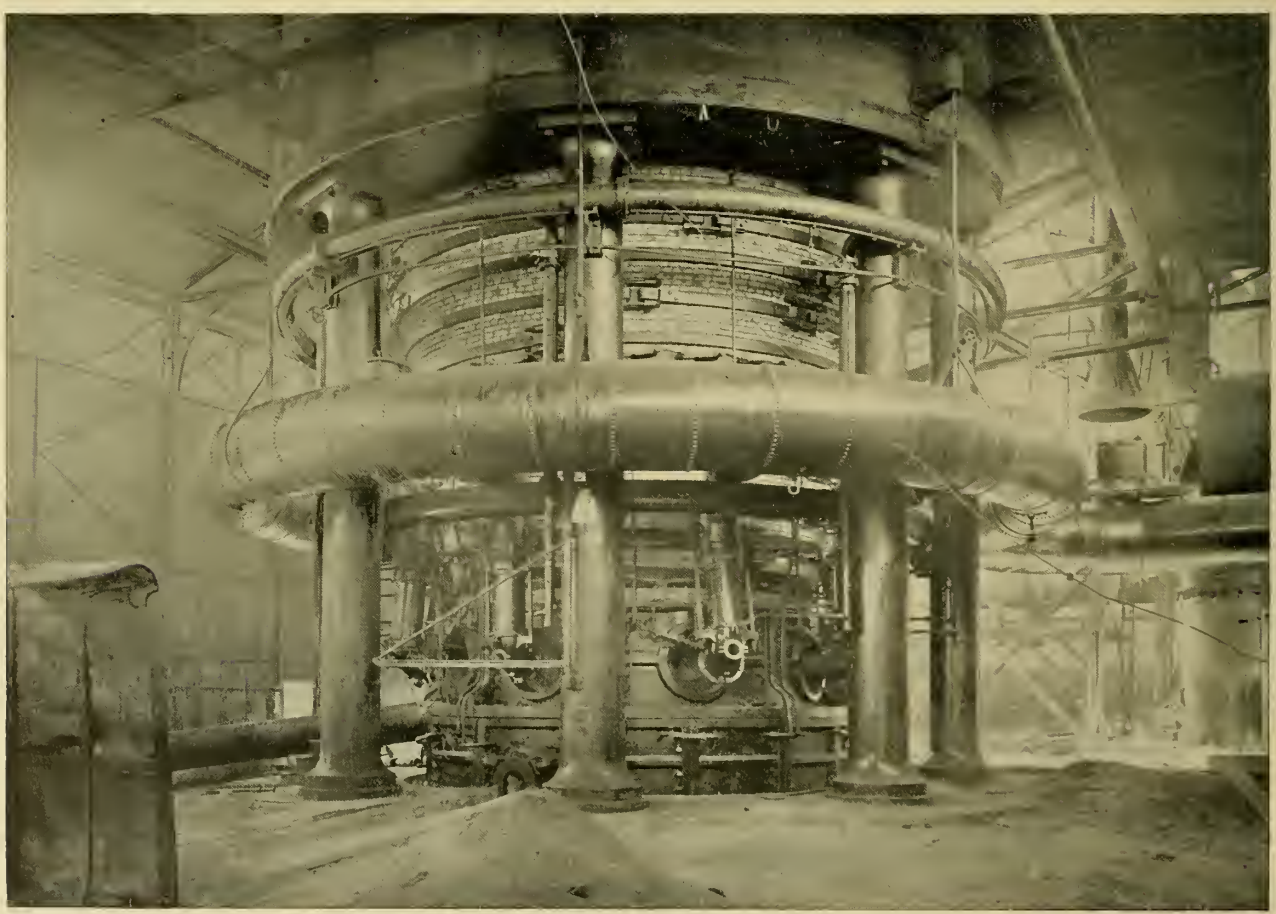
Youngstown, Ohio, April 1, 1893.

This furnace is equipped with **"Pollock's" Bronze Bosh Plates.**

SEE NEXT PAGE.



THE MARYLAND STEEL CO.'S FURNACES, SPARROWS POINT, MD.



THE MARYLAND STEEL CO.'S FURNACE BASE B.

MARYLAND STEEL COMPANY.

SPARROWS POINT, MD.

On the opposite side a view of the above Company's Blast Furnaces is given, 4 in number, which were built from 1889 to 1891.

Each furnace is 85 feet high, 22 feet bosh diameter. 11 feet 6 in. hearth diameter.

Stove equipment consists of 16 in. Witherows' improved Whitwell type.

Blast is furnished by 4 Double Vertical condensing beam engines, built by the Southwark Foundry & Machine Co., Philadelphia, Pa., from designs furnished by Pennsylvania Steel Co., Steelton, Pa.

Steam Power is furnished by 32 Babcock & Wilcox Boilers, approximating 8000 H. P.

Average Temperature of blast, 1300 degrees.

Average Pressure, approximate, 8½ lbs.

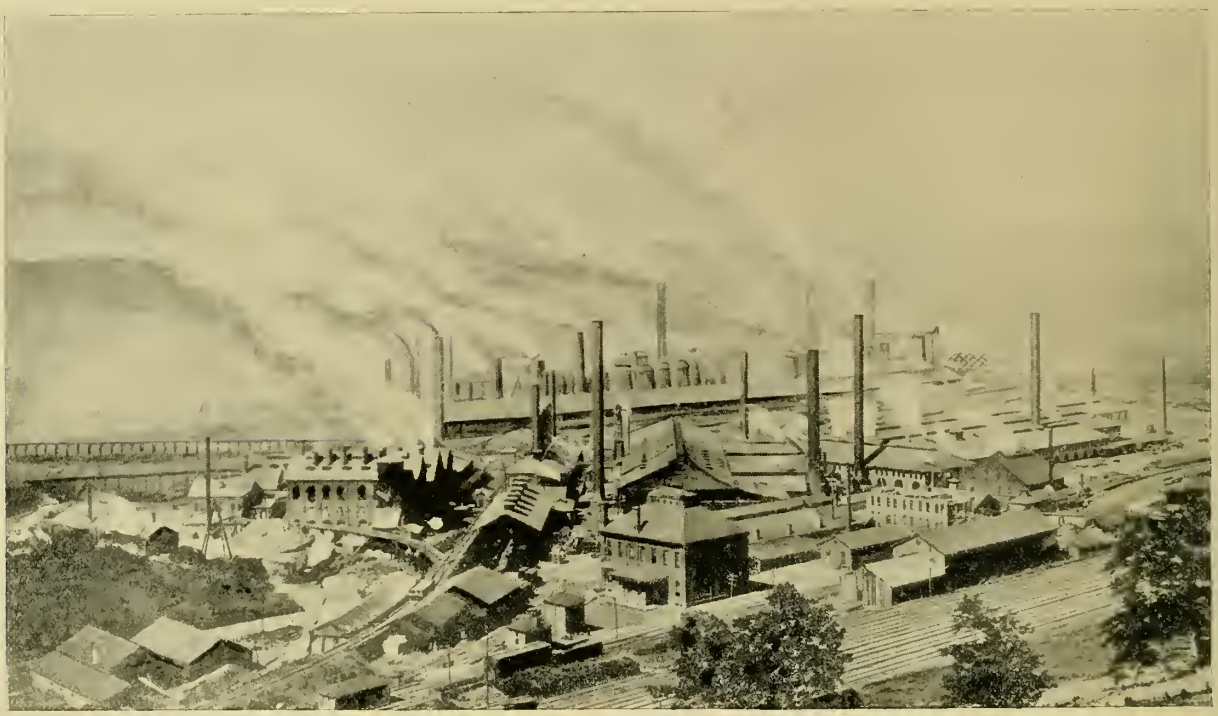
ANNUAL CAPACITY, 400,000 TONS.

The four furnaces were equipped, originally, with Kennedy's Patent Bosh Plate, made of Climax Bronze. When relining A Bosh "Gayley's" removable Bronze plate was used, and in relining B Bosh "Scott's" removable plate was used. See lower cut on opposite page.

The B System of Bosh fitting is used.

For description of Gayley's Patent Bosh Plate see pages 80 and 81.

For description of Scott's Patent Bosh Plate see pages 78 and 79.



THE EDGAR THOMSON STEEL WORKS AND BLAST FURNACES.

THE EDGAR THOMSON BLAST FURNACES FROM THE SOUTH.

The Edgar Thomson Steel Works and Blast Furnaces

AT BESSEMER, PA.

CARNEGIE STEEL COMPANY, LIMITED,

PITTSBURG, PA.

On the opposite side a view of the above well-known works is given. The capacity of the nine Furnaces shown (and two Lucy Furnaces owned by the same Company) is 1,200,000 tons per annum.

Furnace **A**—65 ft. x 15 ft., with four Siemens-Cowper-Cochran Stoves, 65 ft. x 15 ft. each.

" **B**—80 ft. x 18 ft. } with ten Siemens-Cowper-Cochran Stoves, eight of
" **C**—80 ft. x 20 ft. } same 75 ft. x 20 ft., and two 75 ft. x 21 ft.

" **D**—80 ft. x 21 ft. } with six Siemens-Cowper-Cochran Stoves, 78 ft. x 21 ft. each,
" **E**—80 ft. x 21 ft. } and one Whitwell Stove 78 ft. x 20 ft.

" **F**—90 ft. x 22 ft. }
" **G**—90 ft. x 22 ft. } with seven Siemens-Cowper-Cochran Stoves, 78 ft. x 21 ft. each.

" **H**—90 ft. x 22 ft. }
" **I**—90 ft. x 22 ft. } with seven Cowper Stoves, 79 ft. x 21 ft. each.

All the above furnaces are equipped with "Gayley's" Removable Bronze Bosh Plates. Furnace A running on Spiegel has eleven rows of which six rows are above the mantel.

Owing to the thorough bosh protection, several of these furnaces have produced 500,000 tons in one blast of a uniform quality and remarkable low fuel consumption.

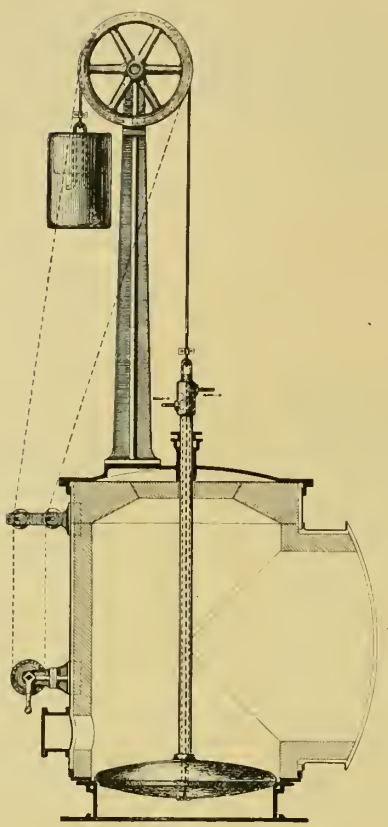
These Bosh Plates are removable, which assures the bosh being kept in perfect shape. See pages 80 and 81.

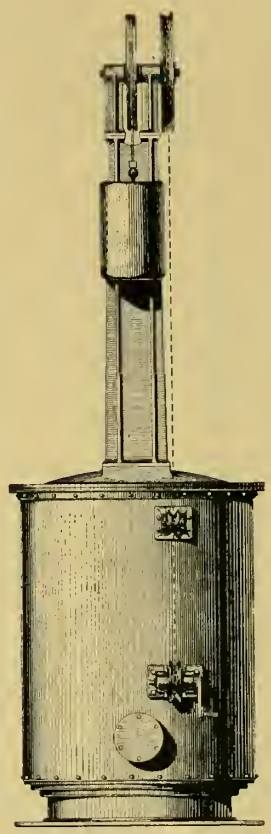
The two Lucy Furnaces at Pittsburg, Pa., each 85 ft. x 20 ft., with eight Stoves of the Whitwell & Cowper type are equipped with "Scott's" Removable Bronze Bosh Plates. See pages 78 and 79.

CHIMNEY VALVES.

ALL STYLES AND SIZES.

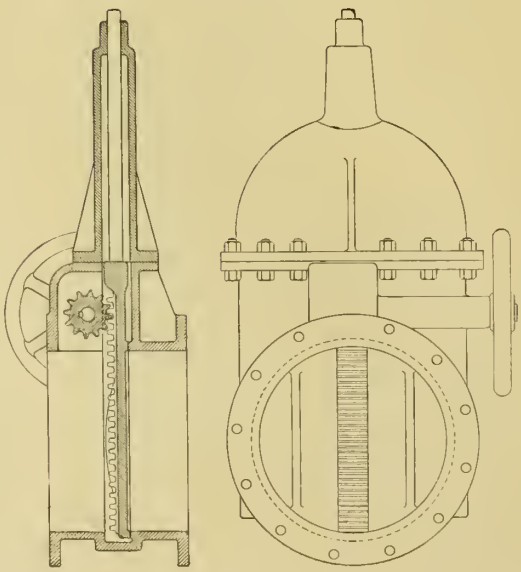
FIG. F 77.





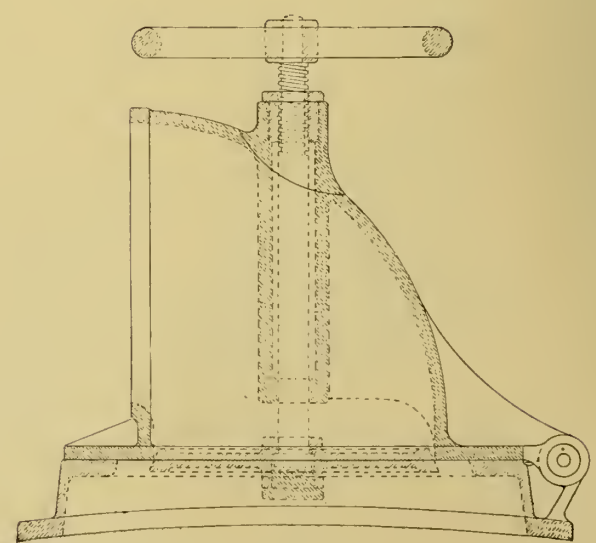
COLD BLAST VALVES.

FIG. F 78.



AIR RELIEF VALVE.

FIG. F 79.

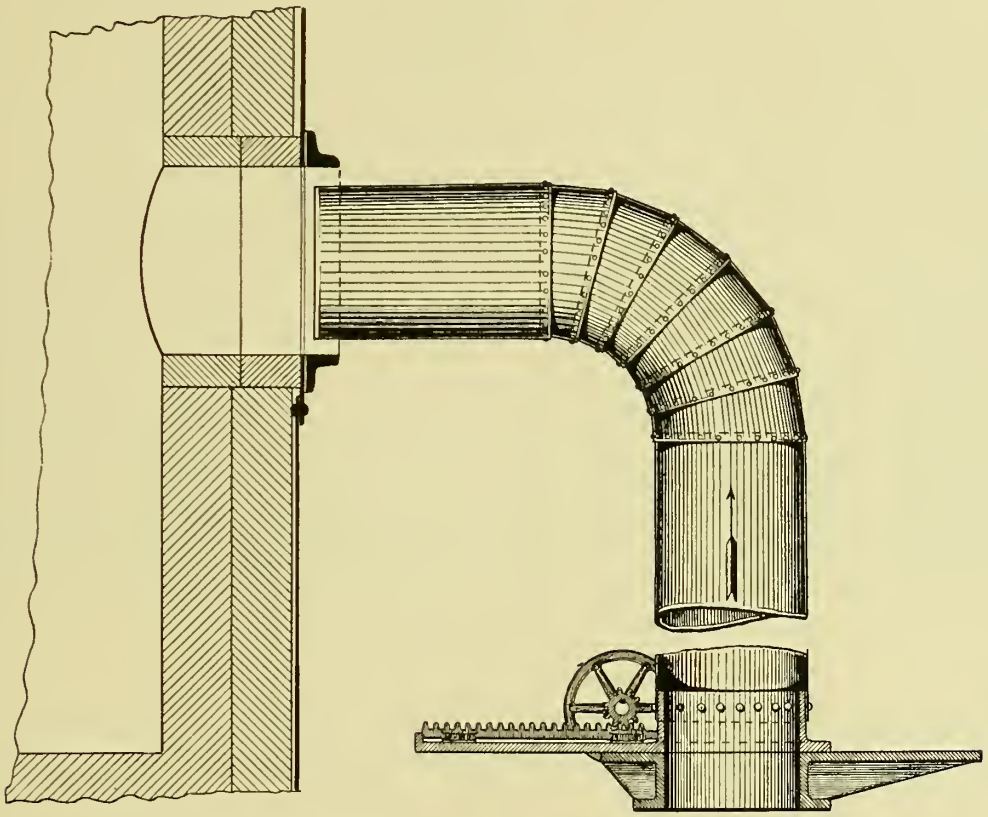


GAS BURNERS FOR STOVES AND BOILERS.

Patented by J. J. Spearman and Hugh Kennedy.

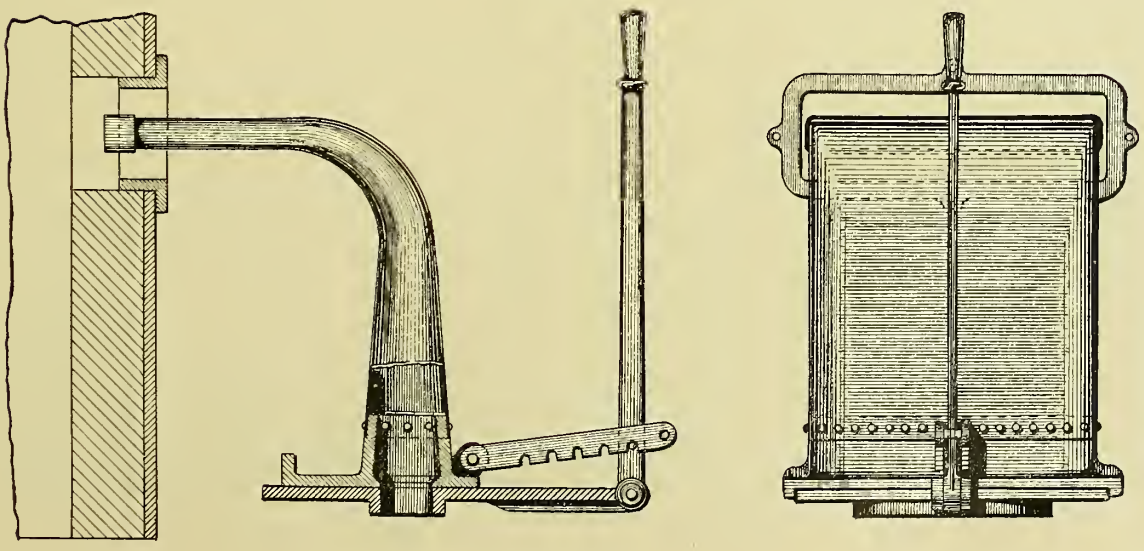
STOVE BURNER.

FIG. F 80.

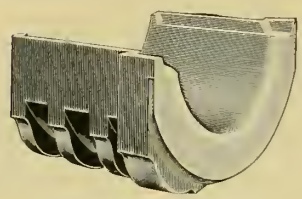


BOILER BURNER.

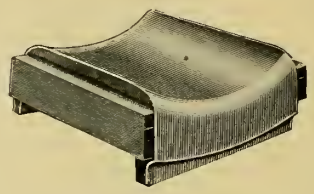
FIG. F 81.



BLOWING ENGINE BEARINGS.

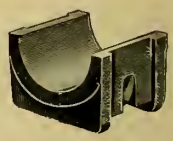


BOTTOM BRASS.
FIG. F 67.

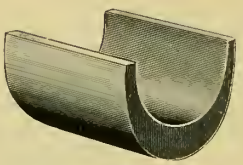


TOP BRASS.
FIG. F 68.

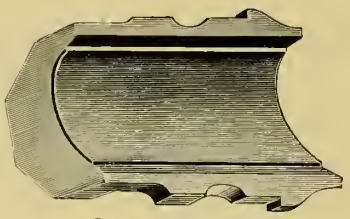
SIDE BRASS.
FIG. F 69.



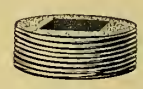
STRAP BRASS.
FIG. F 70.



CINDER CAR BRASS.
FIG. F 71.



CAR BRASS.
FIG. F 72.



FOR REPAIRING TUYERES, ETC.

Countersunk Plug Brass.
FIG. F 73.

Copper Rod.
All Sizes.
FIG. F 74.

STEEL HEARTH JACKETS.

ALL SIZES AND STYLES.

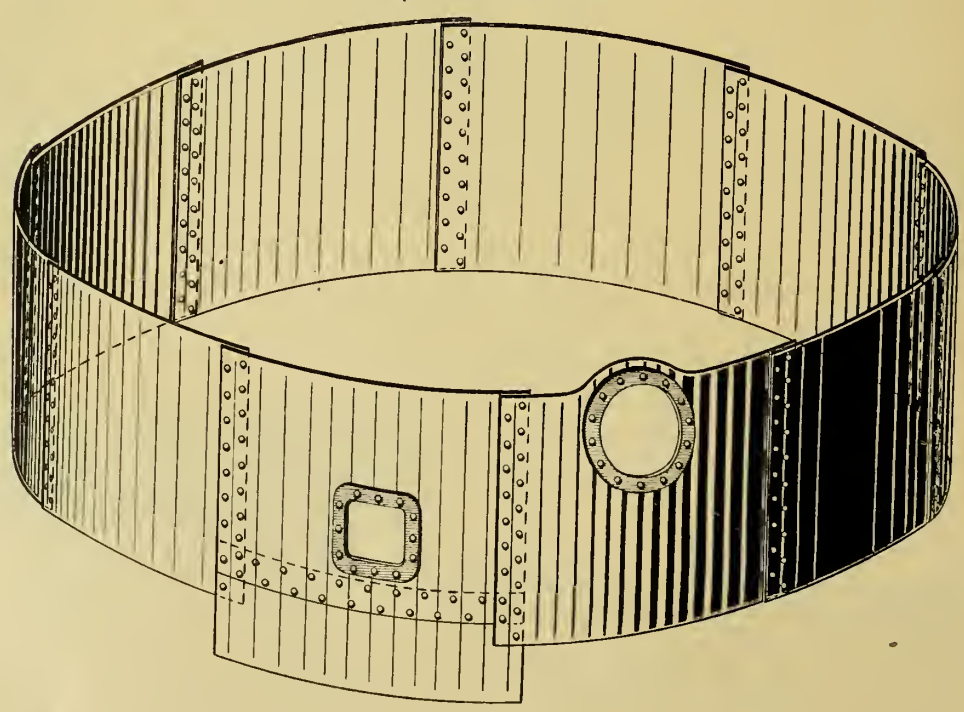
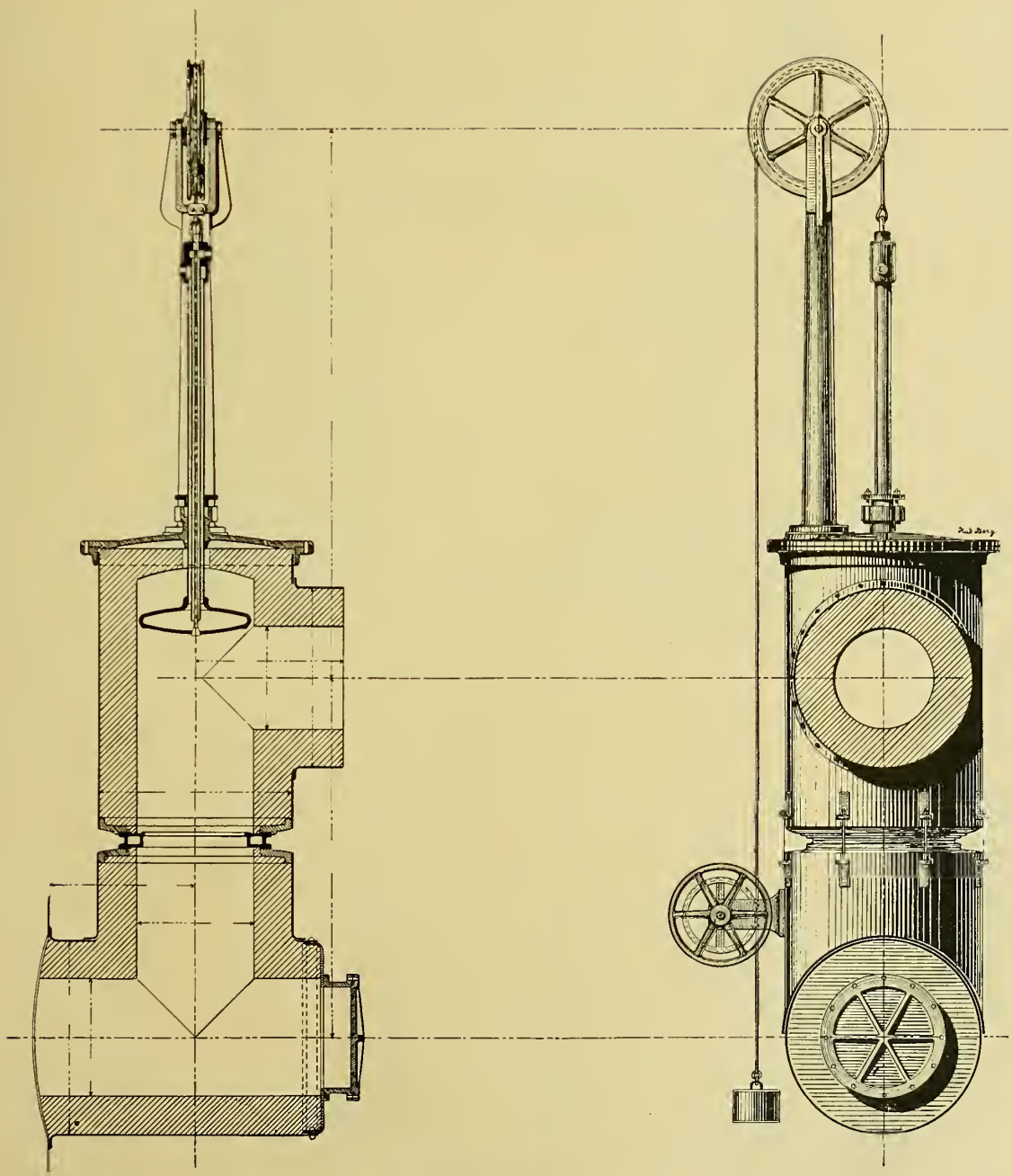


FIG. F 75.

HOT BLAST VALVES.

(With Berg's Patent Seat, Made of Climax Bronze.)

FIG. F 76.

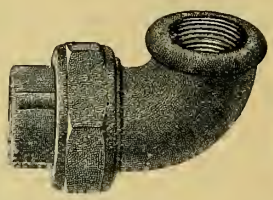


All styles and sizes made to order.

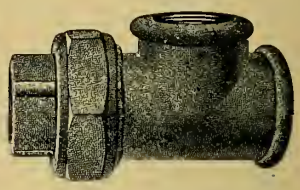
UNIONS.

MALLEABLE UNION.
FIG. F 45.

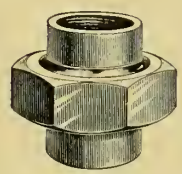
KEYSTONE UNION, (Section.)
Composition Seat.
FIG. F 46.



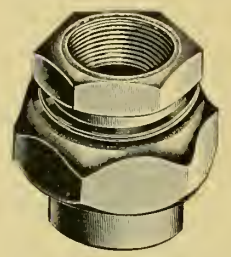
UNION ELBOW.
Female.
FIG. F 47.



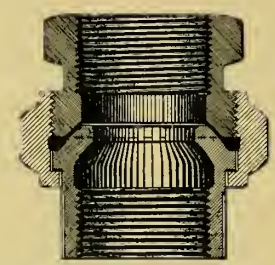
UNION TEE.
Female.
FIG. F 48.



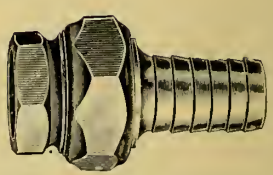
BRASS UNION, (Stand.)
FIG F 49.



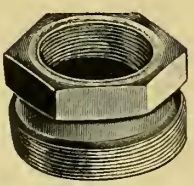
BRASS UNION, (Heavy.)
For Iron Pipe.
FIG. F 50.

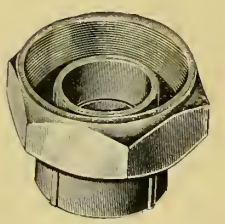


BRASS UNION, (Heavy.)
Section.
FIG. F 51.

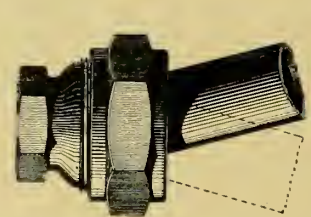


BRASS UNION, (Heavy.)
For Iron Pipe and Hose.
FIG. F 52.

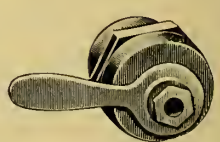




PARTS OF HEAVY BRASS UNION.
Male Half. Female Half or Nut and Swivel.
FIG F 53. FIG. F 54.



UNIVERSAL UNION.
(Heavy.)
FIG. F 55.



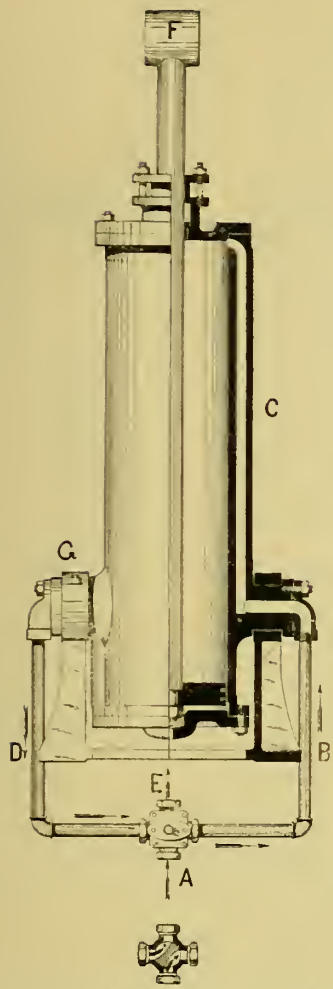
EYE SIGHT.
FIG. F 56.

FUNNELS FOR BOSH AND STOVES.
Round. Flat Back.
FIG. F 57. FIG. F 58.

GOOSE NECKS
For Bosh and Stoves.
FIG. F 59.

HOSE NIPPLES
For Bosh and Stoves.
FIG. F 60.

CLIPS
For Bosh and Stoves.
FIG. F 61.



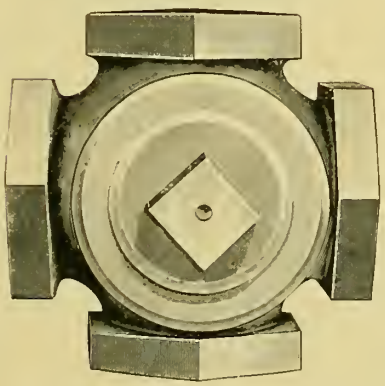
FURNACE BELL CYLINDER
FIG. F 62.

BELL CYLINDERS

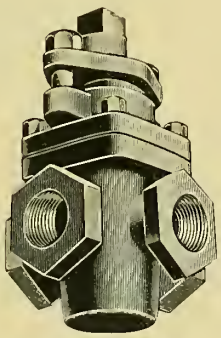
of any diameter to operate with steam is located on furnace platform. Connection is made to beam at F, Cylinder swings on Trunnion G.

OPERATION:—Steam enters Four-way Cock at A, passes through Pipe B and Passage C, forcing piston to bottom as shown, which closes the bell. Steam on lower side of piston has in the mean time been forced through Pipe D and escaped through opposite side of cock and out of E opening. To lower the Bell, Cock Key is reversed. This Four-way Cock is gland packed, provided with brass key, and will not stick or leak.

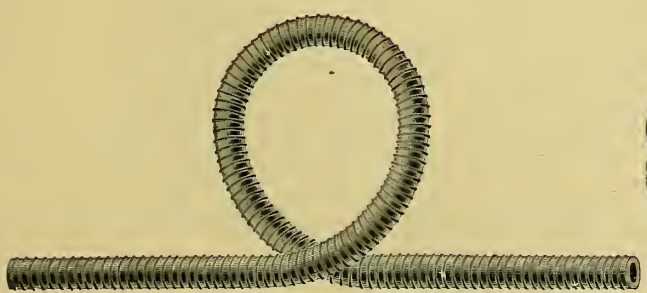
FOUR-WAY COCKS.



REGULAR.
Screwed or Flanged.
FIG. F 63.



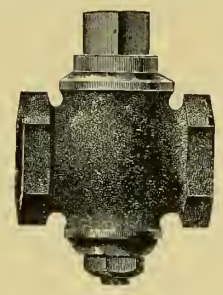
WITH PACKED GLAND.
Screwed or Flanged.
FIG. F 64.



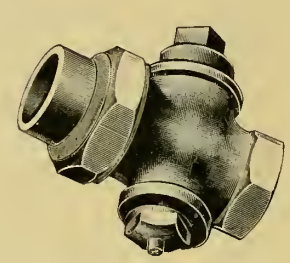
WIRE WRAPPED HOSE.
FIG. F 65.

WIRE ROPE—ALL SIZES.
FIG. F 66.

BRASS COCKS.

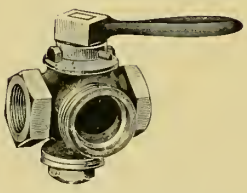


TWO-WAY.
FIG. F 37.

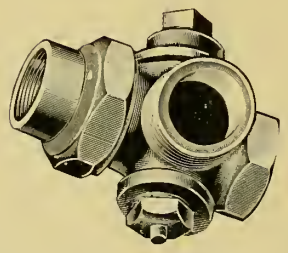


TWO-WAY, with Coupling.
FIG. F 38.

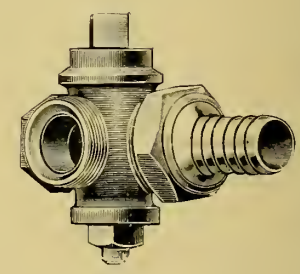
THREE-WAY.
FIG. F 39.



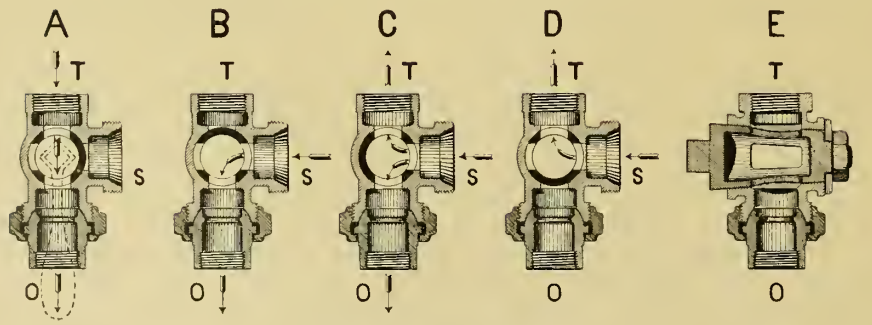
TUYERE COCK, New Style.
Without Coupling.
FIG. F 40.



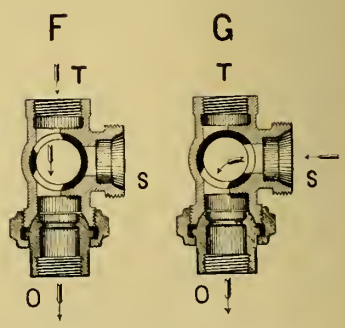
TUYERE COCK, Old Style.
With Coupling for Iron or Lead Pipe.
FIG. F 41.



TUYERE COCK, Old Style.
With Coupling for Hose.
FIG. F 42.



TUYERE COCK, Old Style.
Section.
FIG. F 43.



TUYERE COCK, New Style.
Section.
FIG. F 44.

See page 99 for description.

Save your Tuyeres, Coolers and Bosh Plates by Removing Dirt and Sediment Lodged in them.

This is accomplished not merely by having Bosh fitted with Three-way Tuyere Cocks, but by using them often with steam or water from pressure pump forcing through them.

A quarter of a turn of cock-key, allowing it to remain in this position for a few moments, then turn back to original position, is all that is required to keep castings clean.

EXPLANATION:—Referring to cuts on opposite page, note position of cock-body. The inlet to it is on top or T; outlet to Tuyeres, &c. at O; thread to receive blow out at side S.

The dotted lines in Figure A show the relative position of the Wrench to the Key.

With the key in position as shown in Figure A, water is fed through openings T and O. A quarter turn of the key to the right brings openings in position as shown in B, opening high pressure for cleaning out Tuyere through S and O, as indicated by arrows, the communication to the main supply being shut off at same time. The key in this position shuts the water off the Tuyere entirely if pressure connection is not made at S or side opening.

Another quarter turn of key admits blowing out Tuyere through S and O, and main supply through S and T, as shown in Figure C. The cock should not be used in this position.

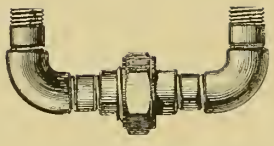
Another quarter turn brings key in position shown in Figure D, brings blow-out into main supply through S and T, which is desirable in case pipe is choked above cock. In the meantime, however, water is shut off Tuyere.

Another quarter turn brings the key to original position, as shown in Figure A. Position of key is invariably as shown in either A and B. Ground joint coupling at O for connection to Tuyere can be used at S and blow-off connected at O, if so desired, for convenience in piping or blowing off.

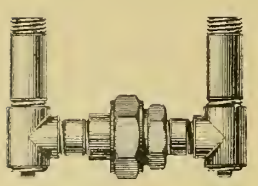
Figure E shows section of Cock looking at same from side on S. Ample opening is provided in the key, so full area of pipe is obtained through it.

Figure F and G show sections of our new style Tuyere Cock, which must always be open or closed, as a stop on the key prevents further movement of same. With this cock, there is no danger of shutting Tuyere water off without knowing it instantly. Blowing into main supply through S and T with this style cock *is not* possible.

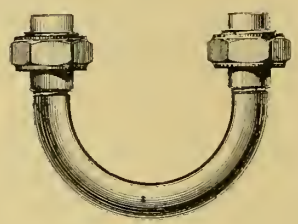
BOSH FITTING.



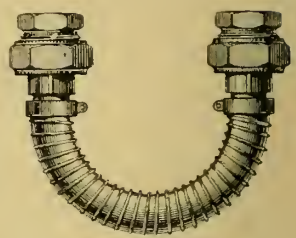
STYLE G.
FIG. F 30.



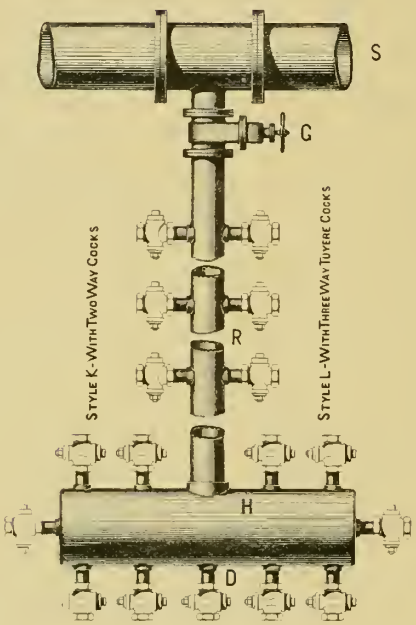
STYLE H.
FIG. F 31.



STYLE I.
FIG. F 32.

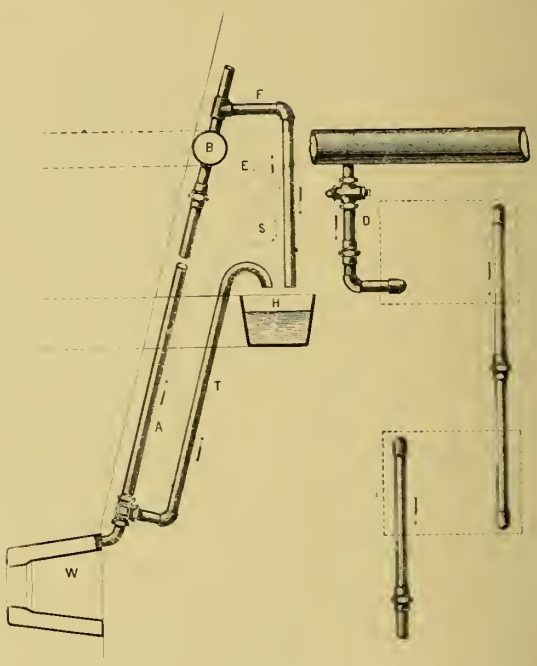


STYLE J.
FIG. F 33.



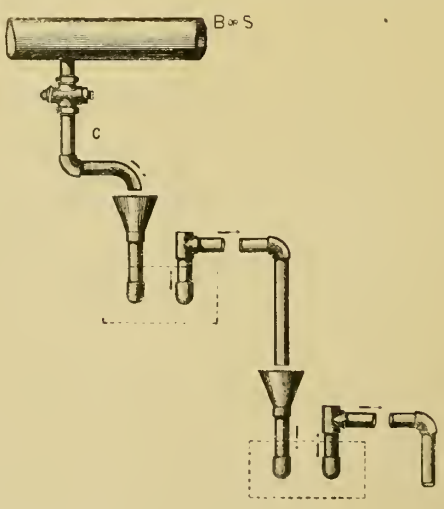
STYLE K.
FIG. F 34.

See page 90 for Manifold on top of Combination Pipe, also page 120, Catalogue A, for Bosh Fitted, style K.



STYLE L.
FIG. F 35.

See pages 70 and 72, showing Bosh Fitted, style L, and full description on page 73.



STYLE M.
FIG. F 36.

See pages 72 and 74, showing Bosh Fitted, style M, and full description on page 75, also page 112.

BOSH FITTING.

CONTINUED.

Figure F 30, shows the method of coupling two Bosh Plates together with Elbows.

Figure F 31, is for the same purpose as Figure 30, having Tees in place of Elbows. By removing plugs a wire can be inserted through the Tee, and if an iron plate is used, obstructions can thus be removed.

Figure F 32, shows two plates coupled together by means of two Unions and bent pipe. This reduces friction to the lowest possible point, and makes the best and neatest job and is mostly used.

Figure F 33, is the same as Figure 32, except Wire-wrapped Hose is used in place of bent pipe. This wire on hose prevents buckling, which would choke off the water and destroy the hose in a short time.

Figure F 34, shows Manifold or Multiple system of Bosh Fitting. This arrangement is the neatest of all Bosh Piping, as it reduces the number of pipes, as compared with each supply being taken independently from the Supply Pipe S. Four or five Tees (according to the number of drops required) with large outlets are placed in the Main Circular Supply S. Next to each Tee, a Valve G, is placed to shut off the entire connection should occasion require. On the Drop Pipe R, openings are used to supply Plates or Boxes, making connections to same short and compact. From Manifold H, the top connections are used for the lower rows of Plates ; end and bottom connections for Tuyeres, Coolers, Notch and Notch Cooler, Spray, &c. By means of Cock D, any sediment in the Manifold can be blown out. The Cocks for controlling water are close and easy of access. Additional openings on Manifolds are made as ordered.

Figure F 35, shows the system of piping for open Boxes, with water not under pressure, and also of utilizing waste water from the Coolers for this purpose. By referring to pages 72 and 73, a clear description is given of the working of this latter arrangement. See also page 114.

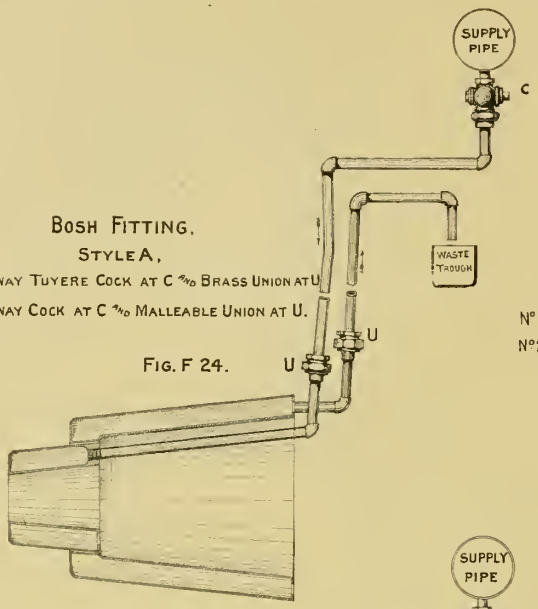
Figure F 36, shows how open Plates are supplied from Main Supply Pipe S direct, or from Auxiliary Supply Pipe B, same as shown in Figure F 35, and described on pages 74, 75 and 112.

Quotations and plans furnished for any style of Bosh Fitting erected complete, or will furnish the material only and instructions for erecting when so desired.

Bosh Fitting,
Style A,

N°1 with 3-way Tuyere Cock at C and Brass Union at U.
N°2 with 2-way Cock at C and Malleable Union at U.

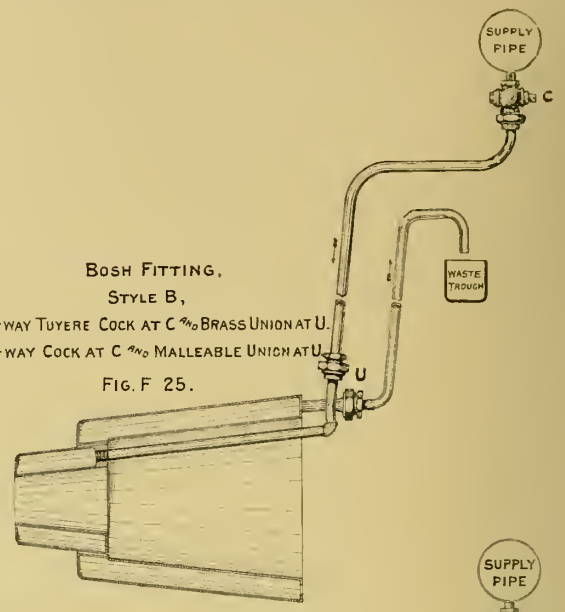
Fig. F 24.



Bosh Fitting,
Style B,

N°1 with 3-way Tuyere Cock at C and Brass Union at U.
N°2 with 2-way Cock at C and Malleable Union at U.

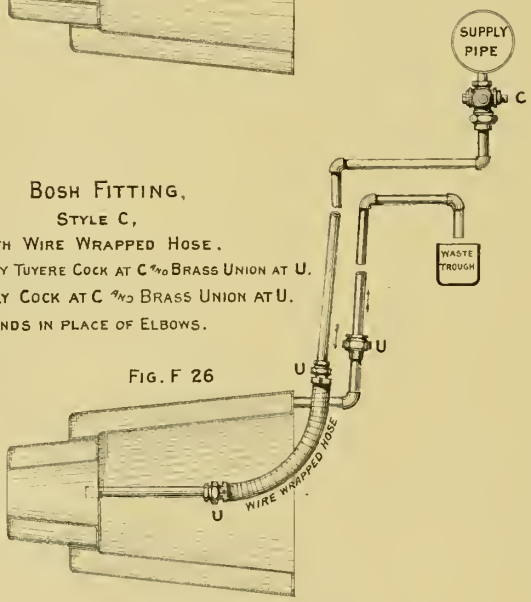
Fig. F 25.



Bosh Fitting,
Style C,
with Wire Wrapped Hose.

N°1 with 3-way Tuyere Cock at C and Brass Union at U.
N°2 with 2-way Cock at C and Brass Union at U.
N°3 with Bends in place of Elbows.

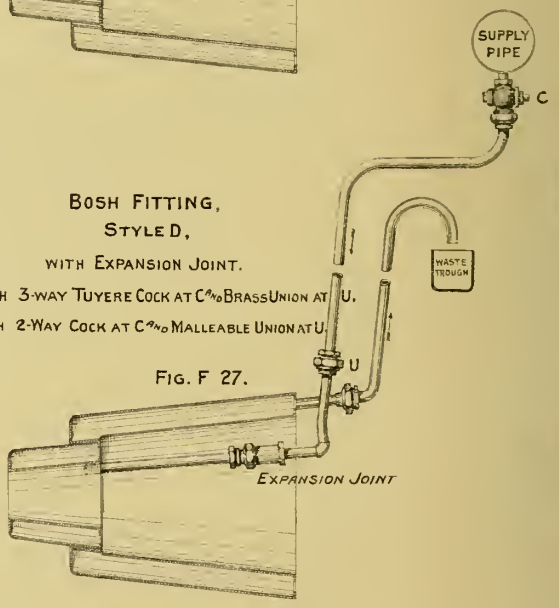
Fig. F 26



Bosh Fitting,
Style D,
with Expansion Joint.

N°1 with 3-way Tuyere Cock at C and Brass Union at U.
N°2 with 2-Way Cock at C and Malleable Union at U.

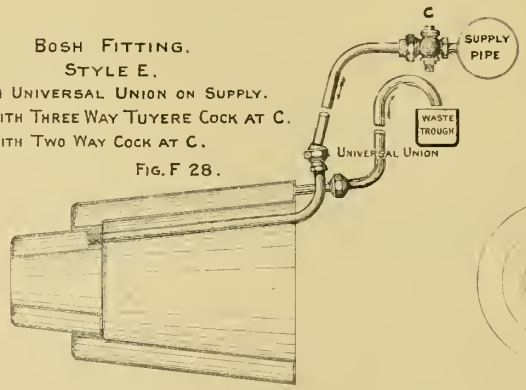
Fig. F 27.



Bosh Fitting,
Style E,
with Universal Union on Supply.

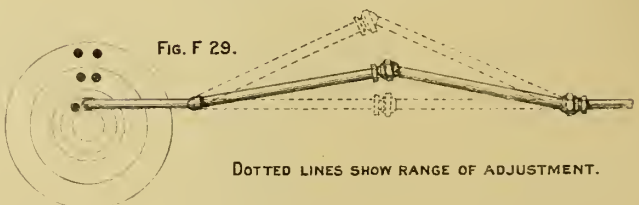
N°1 With Three Way Tuyere Cock at C.
N°2 with Two Way Cock at C.

Fig. F 28.



Bosh Fitting,
Style F,
with Universal Unions.
on Cinder Notch Connections.

Fig. F 29.



Dotted lines show range of adjustment.

See Page 98 for Details of Tuyere Cock and Advantages of same.

Pipe for Bosh Fitting of { Black / Galvanized / Copper / Brass } Pipe.

BOSH FITTING.

By referring to pages 94 and 96, various ways of fitting Bosh Cooling devices are shown that we hope may be of benefit to our present customers and also to those in prospect. This portion of the work about the Bosh is considered by many as of no importance. "Anything will do and any one can do it," seems to be the common practice, and what is the result?

More cooling devices are lost in a single blast than would pay for piping the Bosh first-class a number of times, to say nothing of the loss sustained through numerous stoppages of furnace, inferior iron from the same cause, possibly an explosion or two, and all because of a clumsily fitted and consequently "sloppy" looking Bosh.

Copper or brass pipes make the best and most durable work, and necessarily the most expensive, (first cost only considered), but cheapest in the end.

The advantages of Three-way Tuyere Cocks are set forth clearly on page 99.

Brass Unions should be used on all connections, as iron corrodes in a short time, requiring Unions to be broken when necessary to take them apart.

Figure F 24, No. 2, shows the least expensive connection, namely: Two-way Cock at C and Malleable Unions at U, using Elbows at all quarter turns. No. 1, with Tuyere Cock and Brass Unions is frequently used.

Figure F 25, is the same in every particular as F 24, except that pipe is bent at all quarter turns possible, thereby reducing friction to the minimum. This is the style of fitting mostly used.

Figure F 26, shows the advantage of having Wire-wrapped Hose on the Tuyere supply, allowing ready adjustment of connection with the Tuyere.

Figure F 27, shows an Expansion Joint on the Tuyere supply, making it possible to move the Tuyere back into Cooler when desired.

Figure F 28, shows Brass Universal Union connections to Tuyere and Cooler, and is the LATEST, BEST and NEATEST device for connecting pipes not coming true. This Union is being generally adopted.

Figure F 29, shows the great advantage of the Universal Union on Cinder Notch connections. If pipe is cut so as to couple up, as shown in full lines, a Notch not setting in precisely the same position as one removed, can be coupled up without "profanity" or loss of time, as the range of adjustment clearly indicates.

We make all Tuyere Cocks and Valves extra heavy to stand the rough usage they are subjected to in blast furnace practice.

It likewise sometimes happens with the most carefully handled and skillfully managed blast furnaces that the materials in the upper part will **stick and slip;** during the hanging the fuel around the tuyeres will all be consumed, and the blast air not coming in contact with incandescent fuel, to convert it into a reducing gas (C. O.) acts as in the Bessemer converter; namely, it will oxidize the carbon in the accumulated metal, and the results are that when the **mass drops into the hearth** we have the metal chiefly in the form of wrought iron, a difficult fusible mass of iron, free from or very low in content of carbon, which accumulates around the tuyeres, and by the ordinary way can be removed only by slow, tiresome and costly operation, and can be done only while the blast is off the furnace, during which time the inside is becoming colder, and the trouble still more augmented.

One of the common methods of treatment of troubles of this kind is to try to melt out the accumulations around and in the tuyere, by means of a petroleum blow pipe. While this method is in many cases effective, it can be applied only to one or two tuyeres at a time; will cover only a small area of the tuyere space at the same time, and while the heat generated in many cases is intense enough to melt the mass of decarbonized iron and slag, yet they will remain in the molten condition only long enough to drop out of the hot zone of the blow-pipe flame, from whence it must again be removed by means of a chipping bar and sledge.

With this apparatus, in troubles of this kind, it becomes only necessary to drill a hole through the mass, so that the blast air can enter the inside of the hearth; then feed a mixture of fine charcoal, braze and common salt or sand through the tuyeres. The solid carbon of the charcoal will recarbonize the decarbonized iron, and render it much more fusible. The salt or sand will enter into chemical combination with the infusible slag, and **make it as fusible** as can be desired, so that by this method the trouble can be **easily overcome.**

Then again, we find this apparatus to be very effective in every day work in making foundry or high grade metal from sulphurous coke or selicious ores. It is well known that the more sulphur the coke contains, and the higher in content of selicia the ore is, the greater will be the quantity of limestone necessary to use with them, and the more basic must be the slag. It is likewise well known that by continuing to run a blast furnace on a very basic slag for some time, the **hearth will soon fill up** with this difficult fusible mass. The common practice in cases of this kind, is to turn the furnace off on a sharp scouring slag and metal for a few turns. With this apparatus a **furnace can be kept on a basic slag** by filling through the tuyeres enough of dry sand, immediately after each cast, and when the hearth is empty, to scour out all of this limy accumulation. The sand enters the furnace at a point where it does not affect the grade of the metal produced, and by this means a **furnace can be kept running** for a long time on a very limy slag, without filling up the hearth, particularly if the limestone of the charge be broken up into small pieces before it is charged into the top of the furnace with the ore, etc.

We find that the best results are always obtained by increasing the fineness of the lumps of limestone charged into the tunnel head, with the quantity of that material it becomes necessary to use.

BELLY PIPE.

STYLE A.

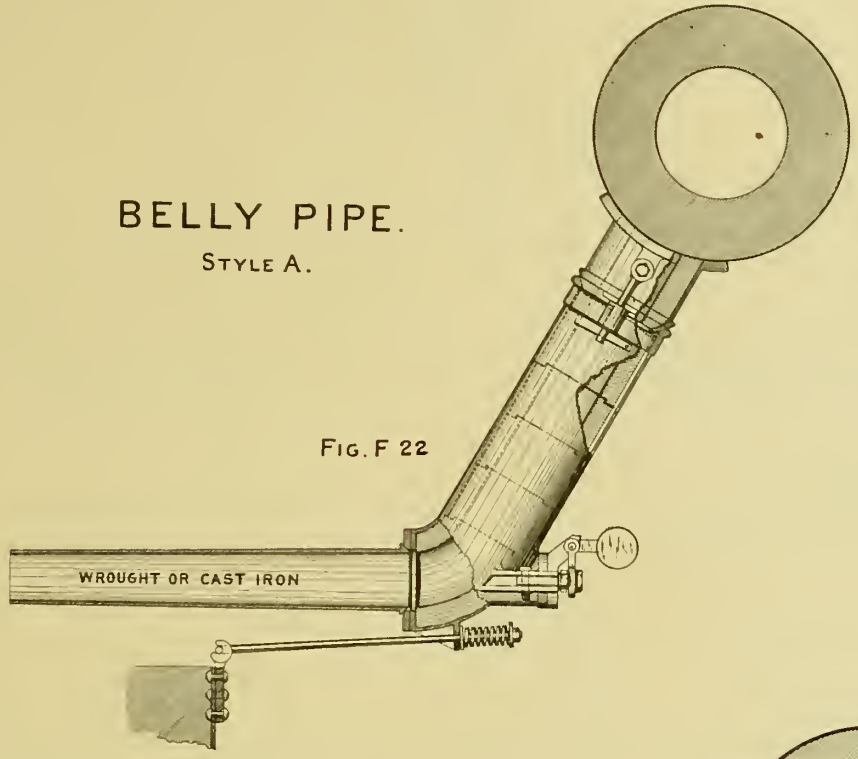


FIG. F 22

MANUFACTURED BY
BEST, FOX & CO.,
PITTSBURG, PA.

BELLY PIPE.

STYLE B.

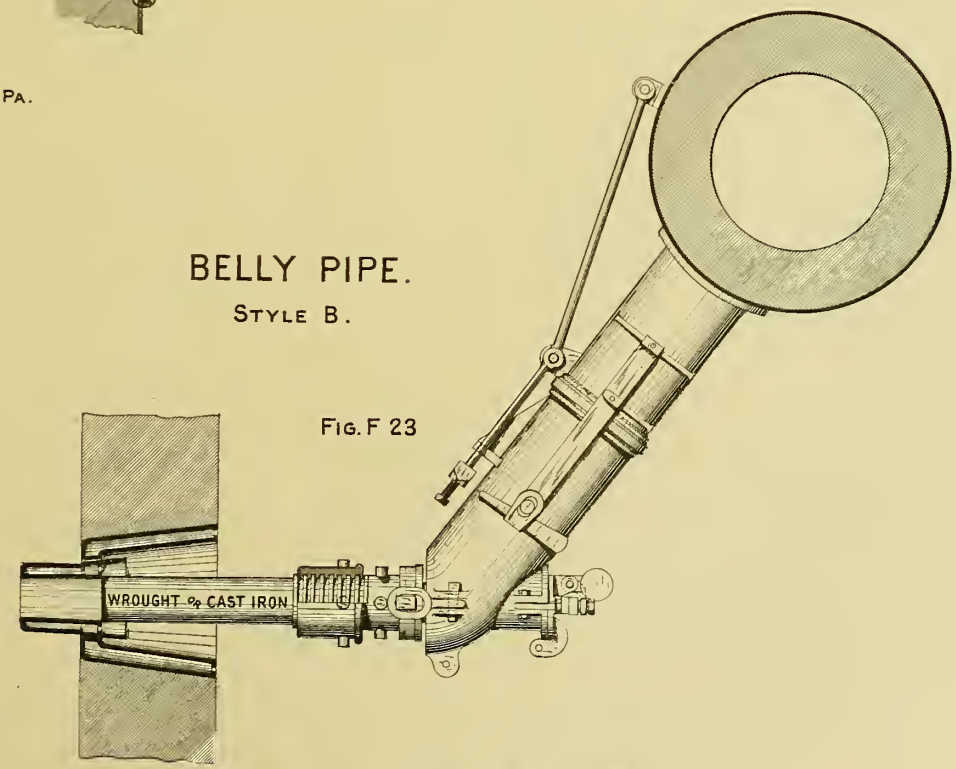


FIG. F 23

ANY STYLE OF BLOW PIPES TO ORDER.

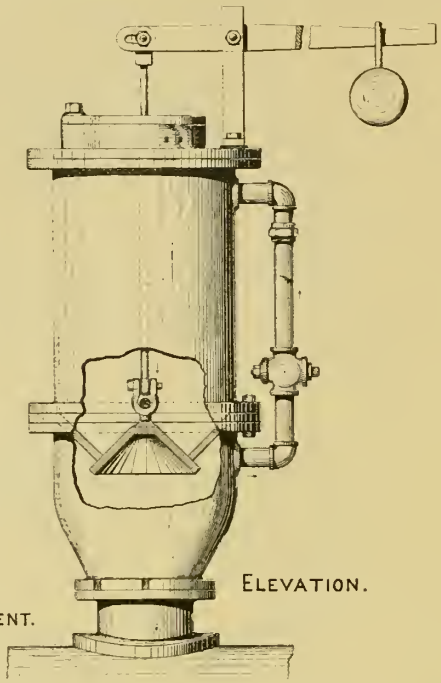
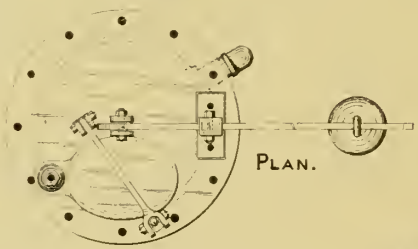


Fig. F_16.
MEDICINE FEEDER.
Fronheiser's Patent.

Elevation.

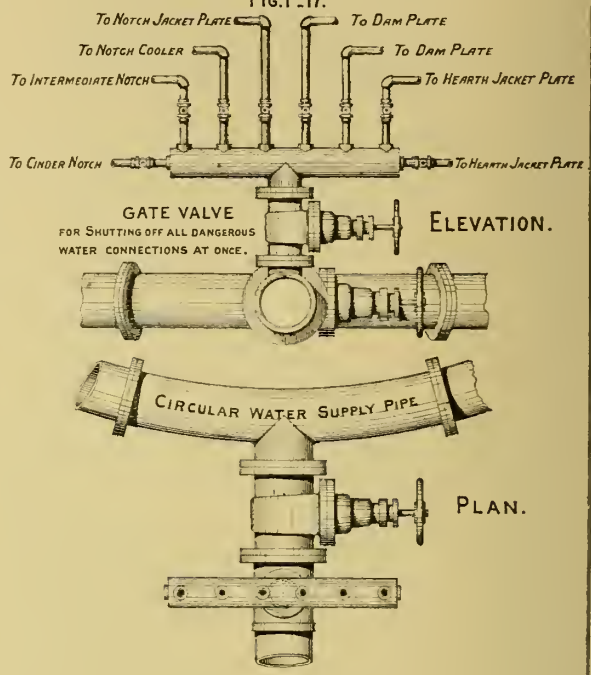


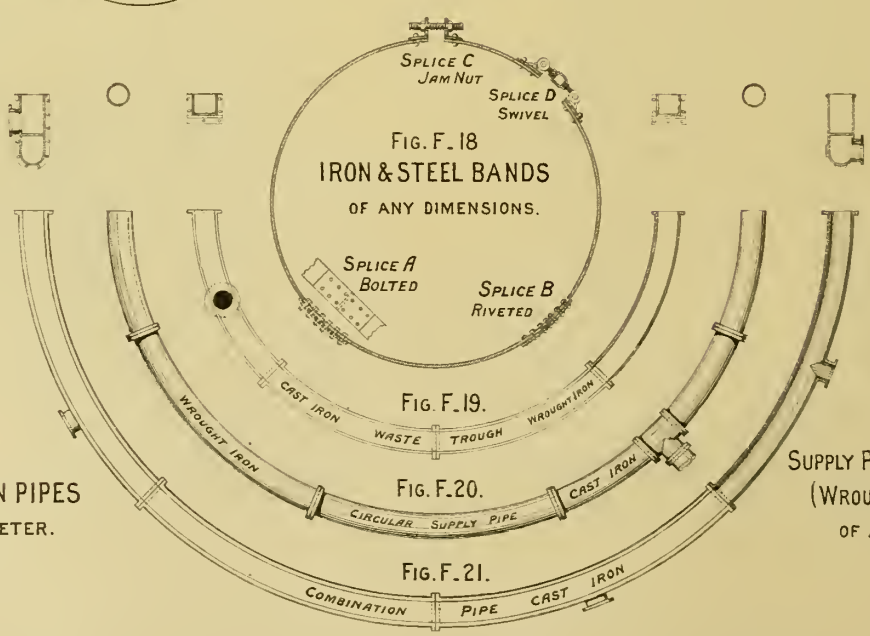
Plan.

MANIFOLD.

Located in the Rear of Furnace, for feeding all water connections about Iron & Cinder Notch.

Fig. F_17.





Combination Pipes
of any diameter.

Supply Pipes & Waste Troughs
(Wrought or Cast Iron)
of any Diameter.

MANIFOLD CONNECTION, Fig. F. 17.

In case of *Explosions or Breakouts* at tapping hole or cinder notch it is very desirable to have the cocks controlling water to notch and dam plate connections away from place of danger and at a point that can be reached safely.

By the use of a manifold located at the rear of the furnace all these connections can be shut off at once by closing the valve directly under the manifold or any single connection by closing cock directly above same.

By referring to illustration on opposite page the advantage of this connection will be understood.

MEDICINE FEEDER FOR BLAST FURNACES, Fig. F 16.

(FRONHEISER'S PATENT.)

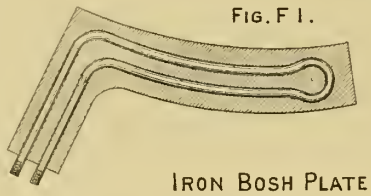
Feeder is secured to Bustle Pipe immediately over openings leading to tuyeres. Feeder is charged by removing slide on top by simply unloosing a thumb nut. Adjustment for feeding is obtained by moving weight on lever, and by means of operating cock on bypass, the full blast pressure can be brought on top of material and forced through valve at any required speed.

This apparatus is used for **introducing solid materials,** fuel or fluxes into a blast furnace, through the tuyeres, without throwing off the blast, and having these bodies introduced into the hearth of the furnace just at the point where their effects are required to **promptly clean out** any accumulations of excessive lime, metal, etc., without affecting the quality or grade of metal produced, or interfering with the continuous operation of the furnace.

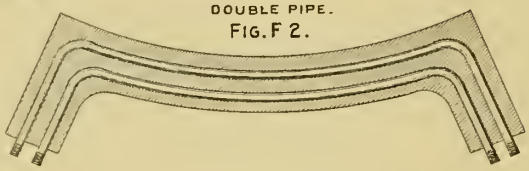
It often happens that when a blast furnace is hanging or scaffolded, too cold, or when the metal and slag from some other cause are **too thick to run from the furnace,** it becomes necessary to put sand, common salt, fluor spar, or other chemicals or fuels of different kinds into the hearth of the furnace. Under the present customary arrangements, the blow pipes are either taken down entirely and the material introduced through the tuyeres, or a cap on the end of the blow-pipe is removed and the pipe is filled with the material, so that it will be carried into the hearth after the blast is turned on.

All of these manipulations, however, **necessitate throwing the blast** off from the furnace before the material can be introduced, and this has the disadvantage that just as soon as the blast pressure is removed, cinder and metal are apt, in some part of the furnace, to run back into the tuyeres, causing not only hard work to remove the same, but in addition, great loss of time. By putting the sand, etc., into the furnace at the tunnel heads with the ore, etc., you are not only obliged to **wait from 12 to 24 hours** or more till it reaches the tuyeres, but it likewise has the disadvantage of rendering the slag more acid in composition, producing pig iron higher in content of sulphur and combined carbon of a much lower grade, during the entire time that it is at work. By this apparatus material can be fed into the blast furnace through the tuyeres continuously, if desired, without stopping the blast.

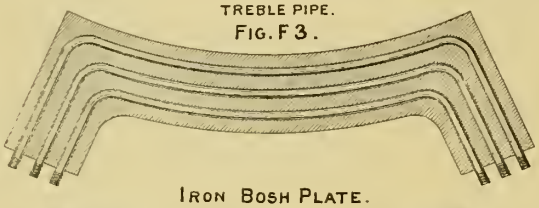
IRON BOSH PLATE - ONE ARM.
FIG. F 1.



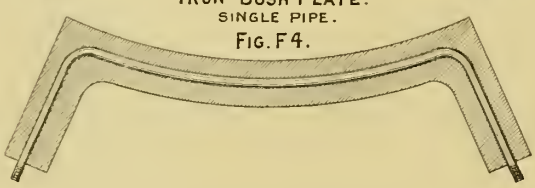
IRON BOSH PLATE.
DOUBLE PIPE.
FIG. F 2.



IRON BOSH PLATE.
TREBLE PIPE.
FIG. F 3.

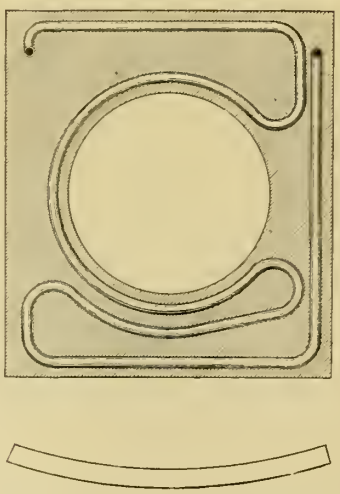


IRON BOSH PLATE.
SINGLE PIPE.
FIG. F 4.

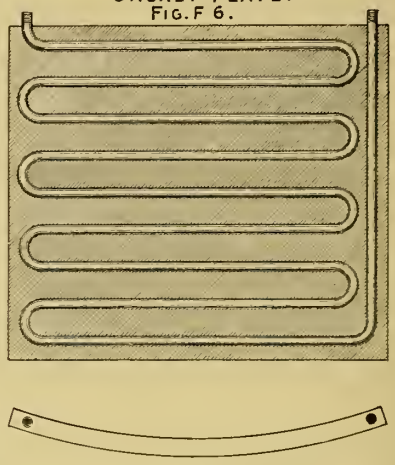


COILS MADE OF { IRON / STEEL / BRASS / COPPER } PIPE.

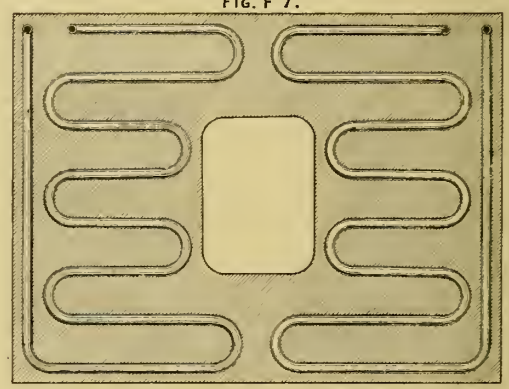
COOLER JACKET PLATE.
FIG. F 5.



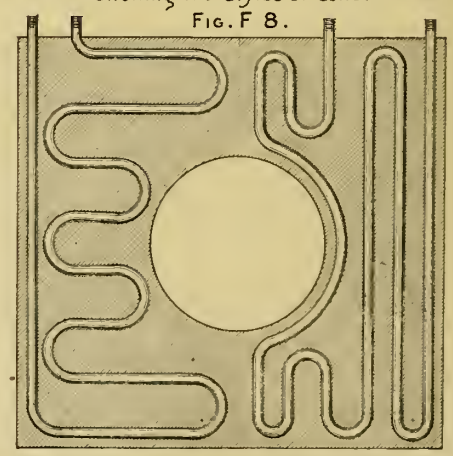
JACKET PLATE.
FIG. F 6.



DAM PLATE.
FIG. F 7.



CINDER NOTCH JACKET PLATE.
Showing two Styles of Coils.
FIG. F 8.

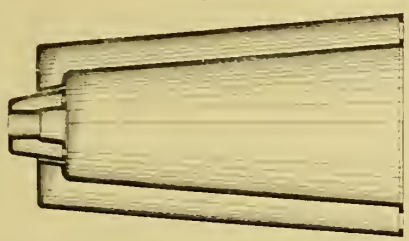


MANUFACTURED BY
BEST, FOX & CO.
PITTSBURG, PA.

COILS AND PLATES OF ANY DESCRIPTION TO ORDER.

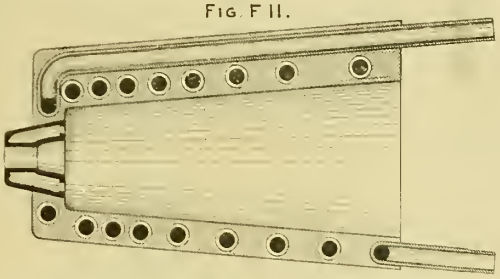
COMBINATION OF
Nº 50 BRONZE CINDER NOTCH &
Nº 197 BRONZE CINDER COOLER.

FIG. F 9.



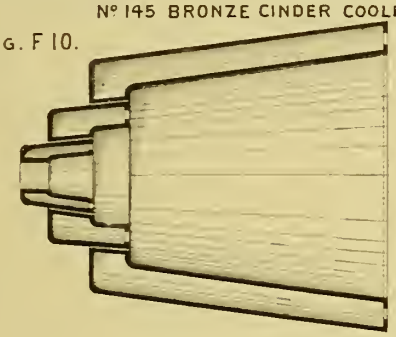
COMBINATION OF
Nº 50 BRONZE CINDER NOTCH
AND IRON CINDER COOLER.

FIG. F 11.



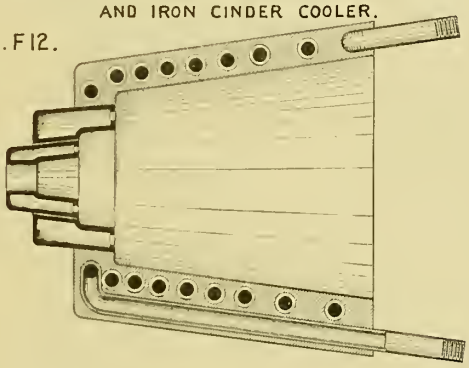
COMBINATION OF Nº 92 BRONZE CINDER NOTCH,
Nº 323 BRONZE INTERMEDIATE COOLER,
Nº 145 BRONZE CINDER COOLER.

FIG. F 10.



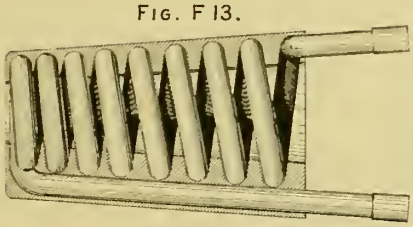
COMBINATION OF Nº 92 BRONZE CINDER NOTCH,
Nº 323 BRONZE INTERMEDIATE COOLER,
AND IRON CINDER COOLER.

FIG. F 12.



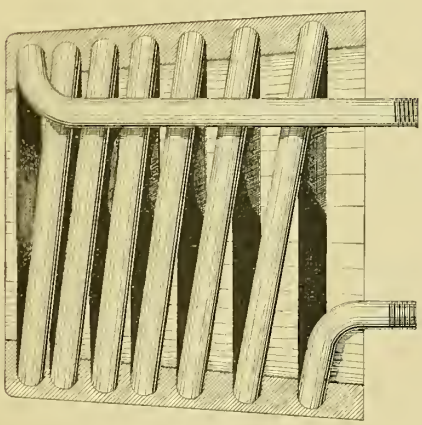
IRON TUYERE WITH COILED PIPE.

FIG. F 13.



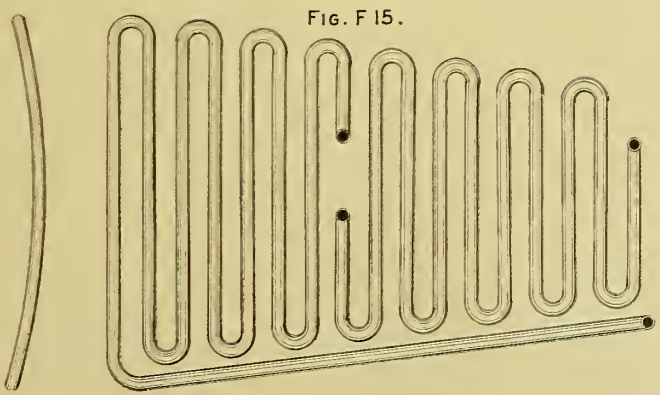
IRON COOLER WITH COILED PIPE.

FIG. F 14.



BOSH JACKET COILS.

FIG. F 15.

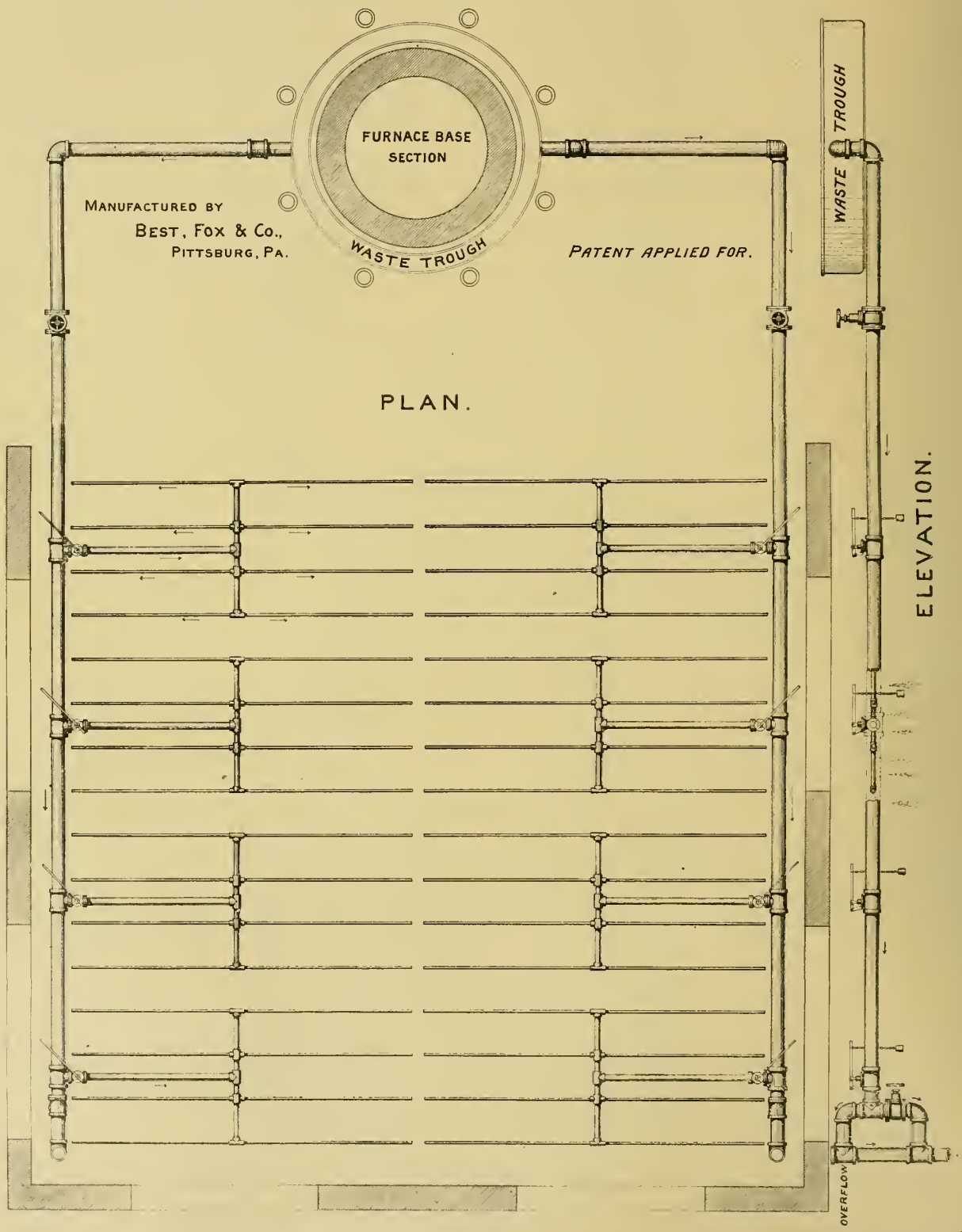


MANUFACTURED BY
BEST, FOX & CO.
PITTSBURG, PA

TUYERE AND COOLER COILS OF ANY DIMENSION FURNISHED WITH OR WITHOUT METAL ATTACHED.

SPRAY PIPE

FOR COOLING PIG BEDS WITH WASTE WATER.



BIG BED SPRINKLING SYSTEM.

PATENTED.

On opposite side we show a piping system for cooling the pig beds of blast furnaces, by making use of the discharge water from the trough.

A large water feed is run down the sides of the cast house, supported from the roof trusses, as shown. From this main, which is generally 6 inches, 3-inch branches are run, with a lever valve to control each section. From each 3-inch pipe a series of spray pipes again branch off, and are placed directly over the pig beds.

When any section of the beds is required to be cooled a hook or weight, that is attached to the lever of the table is removed, and the valve is so constructed that the pressure will at once raise the lever, open the valve and allow the water to pass along to the section that is to be sprayed. Replacing the hook or weight at once shuts off this section.

To insure the 6-inch main supply always being full of water, and giving the required pressure, an overflow is provided as shown, and is so arranged as to prevent overflow at waste trough of furnace. When the furnace is banked, and the water not required at the pig beds, the waste can be run direct to sewer by opening a valve in connection with the overflow arrangement.

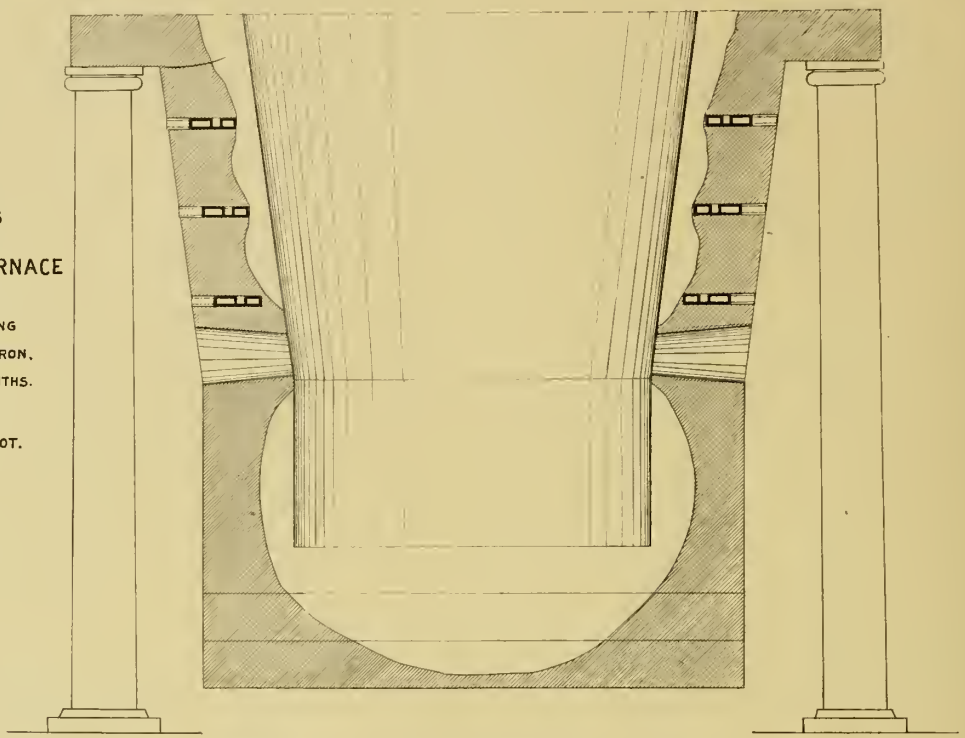
If at any time repairs are needed in connection with this piping system, valve near waste trough can be closed, and any part of the system repaired or taken down while the furnace is running.

This system insures a heavy shower of water without any labor or expense connected with same, and does away with the wasting and wearing out of hose, and requires no power to elevate water for this purpose.

Plans, specifications, and estimates on application.

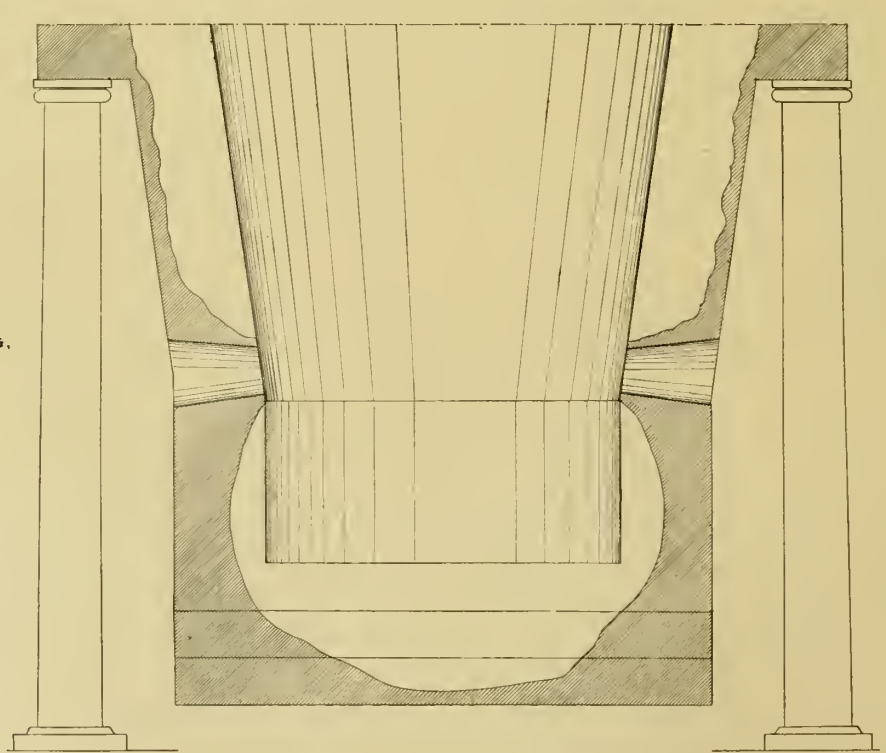
BOSH LINES
OF
ISABELLA FURNACE
STACK Nº2,
AFTER PRODUCING
297,968 TONS OF IRON,
IN 4 YEARS. 10 MONTHS.

SCALE 3/8" = 1 FOOT.



BOSH LINES
OF
FURNACE
HAVING
NO WATER COOLING,
AFTER RUNNING
3 MONTHS.

SCALE 3/8" = 1 FOOT.



BOSH COOLING vs. NO BOSH COOLING.

On the opposite page the ADVANTAGES of BRONZE BOSH COOLING, as compared with NO COOLING, is clearly set forth.

We recommend BRONZE bosh cooling, instead of Pipe or Iron plates, for the same reasons that BRONZE tuyeres are superior to iron ; i. e.:

IRON COOLING is

INEFFECTUAL,

EXPENSIVE,

NOT REMOVABLE,

CORRODES and CHOKES up.

The object of all Bosh Cooling is to hold the Original Lines Intact as nearly as possible. This can only be done with the use of Climax Bronze Cooling devices.

The following advantages are thereby obtained :

1. Long and satisfactory run.
2. Large and regular product.
3. No slipping.
4. Low fuel consumption and cheap iron.

Where no bosh cooling is used the brick work is soon cut out, as shown in lower cut on opposite page. This enlarged space must be filled with fuel, with an actual decrease in product.

We know of instances where 27 inch bosh walls were cut in 30 days to 4½ inch, and one instance where this occurred with iron plates, owing to faulty spacing.

We do not claim that any of the bosh cooling devices made by us will accomplish wonders as to quality, quantity and cost of output, without No. 1 fire clay and brick well laid in connection with same.

Harbison & Walker's " Benizet" were used in Isabella Bosh.

The large output on Isabella Furnace Bosh, as shown (this was from May 27th, '86 to April 2d, '91), is nothing unusual, as several furnaces at Edgar Thompson Steel Works have made outputs of over 500,000 tons on a single bosh lining, and still left the BRONZE plates in GOOD CONDITION for use in relining again.

The average life of a bronze plate is from three to five blows, which brings the cost of same (taking value of scrap into consideration,) cheaper by 50 per cent, as compared with iron.

HUGH KENNEDY'S

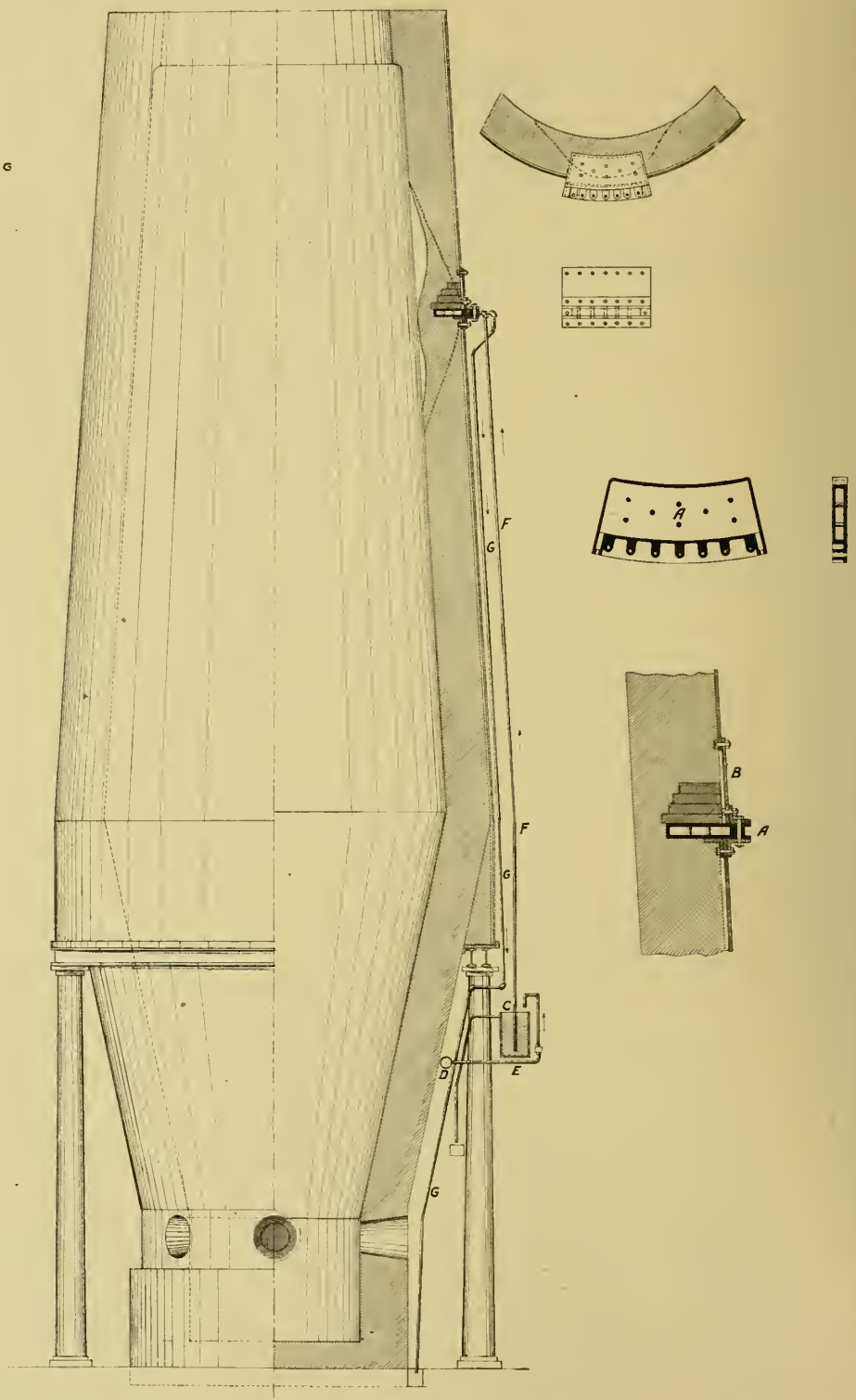
PATENT DEVICE FOR REPAIRING

FURNACE LININGS.

MANUFACTURED BY

BEST, FOX & CO.

PITTSBURG, PA.



HUGH KENNEDY'S DEVICE FOR REPAIRING FURNACE LININGS.

On opposite page, a thin place, where the lining is worn through, is shown. When the point of danger is discovered, the blast is stopped and the spot cooled by a stream of water thrown against it. A piece of the shell, of sufficient size to expose the thin part of the lining, is then cut out and angle iron riveted or bolted to the inside of the shell at the lower edge of the cut, and another piece of angle iron on the outside. On the horizontal flanges of the angle iron a special plate is placed. The plate is held firmly by bolts passing through plate, outside angle iron referred to, and angle iron attached to sheet B.

On the top of this plate, on the inside, brick work is placed as shown. This being an obstruction in the path of the descending stock, it will deflect same away from the plate and prevent the stock from rubbing against the thin part of the lining below the plate ; and also deflect the ascending stream of air out into the furnace and cause it to find a new channel. This causes a layer or pocket of partly melted stock, furnace dust, etc., to form below and under cover of the plate, against the thin portion of the wall, which protects the plate from the heat and in that way further insures its safety.

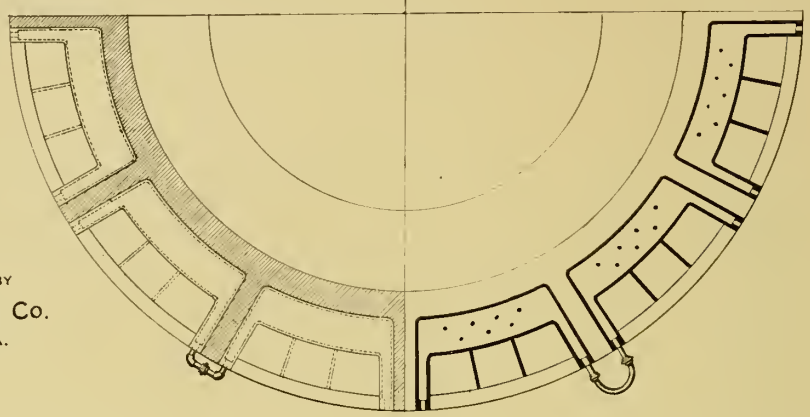
This device has been used on two occasions at the Isabella Furnaces, Pittsburgh ; in one instance having made 16,000 tons of iron thereafter, and in the other instance 30,000 tons. The time required to do the entire work did not exceed twenty-four hours.

The method of furnishing this plate with water to insure perfect safety is shown by reference to the cut.

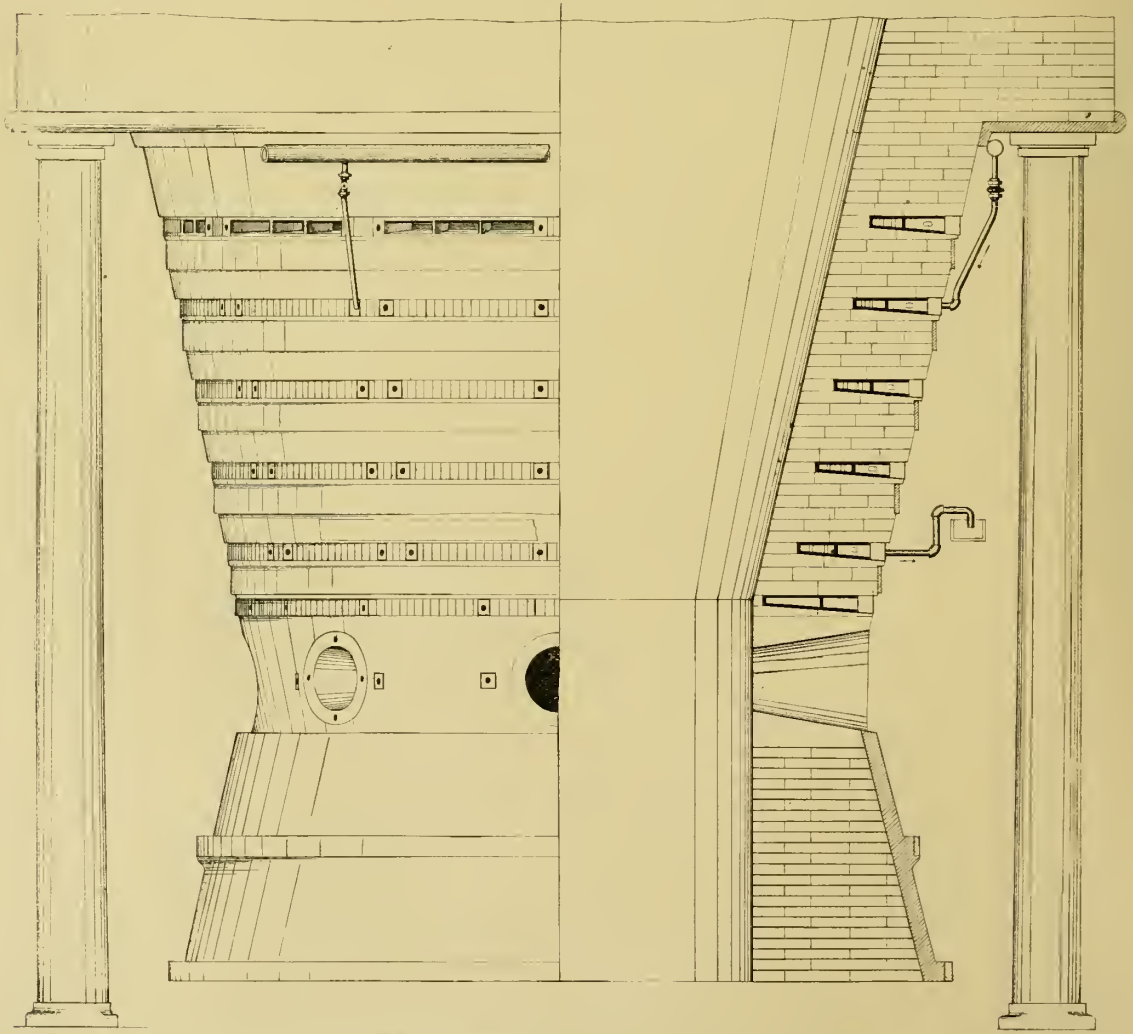
Tank C, placed near the mantel and fed from main supply pipe D, and is provided with overflow to main waste trough around furnace.

From tank C the water is drawn up to the plate through pipe F, on the syphon principle. The waste from the plate is carried down through pipe G below tank C and emptied at bottom of furnace. The moment the plate develops the slightest leak, air is admitted into same and the water immediately falls back to its original level, thereby insuring positively that no water will get into the furnace.

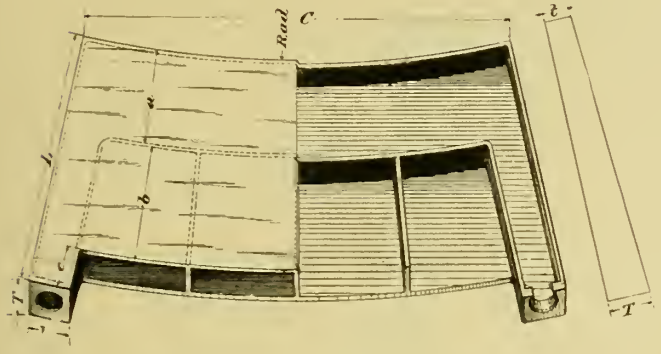
GAYLEY PATENT BOSH PLATE.



MANUFACTURED BY
BEST, FOX & CO.
PITTSBURG, PA.



GAYLEY'S PATENT BOSH PLATE.



This bronze plate is wedge shaped, and has a plain surfaced top and bottom. (The latter is a special feature of the patent.) There is but one water course. The water is admitted through one arm to the cooling chamber, passes through, and is discharged at the other arm. This uninterrupted passage prevents the deposit of sediment.

The studs in the water course and the webs outside, resist any crushing by the brick work; long experience has shown, however, that there is practically no crushing force, as the brick courses above plate retain their position when the plate is removed as rigidly as if arched. The webs are provided with openings for the insertion of a withdrawing hook. The plates can be withdrawn as readily as a tuyere, and a new one one inserted. If the plate is found to have been "drilled" by iron, it can be plugged and reinserted. The water space being ten inches wide, provides a large body of water at the hottest part of the furnace, and prevents the walls from cutting back. This space is of such capacity that it produces eight times the cooling effect obtained from a plate with two iron coils 1¼ inches in diameter.

In building these plates in the bosh wall, put in a clay packing 5/8 inch thick around plate, and a strip of wood one inch thick along ends of plate. This will char and allow for expansion. As the arms are short, bricks on edge can be placed in between if desired, to give a better finish to exterior brick work. This plate does not require bricks of special shape, and only one band is required for each row of plates. These plates possess a great advantage in that they may be of any size without interfering in any way with the construction.

Practical results obtained by the use of these plates demonstrate that:

The removable plates cause no loss of Bronze metal.

They will preserve in perfect shape the interior of the furnace.

The fuel consumption does not increase as the furnace gets older.

The insertion of these plates in the bosh wall of an old furnace will increase its output ten per cent. This change can be made in twenty-four hours.

The bosh walls are so thoroughly protected that they will continue in perfect shape for a product of 400,000 to half a million tons in a single blast.

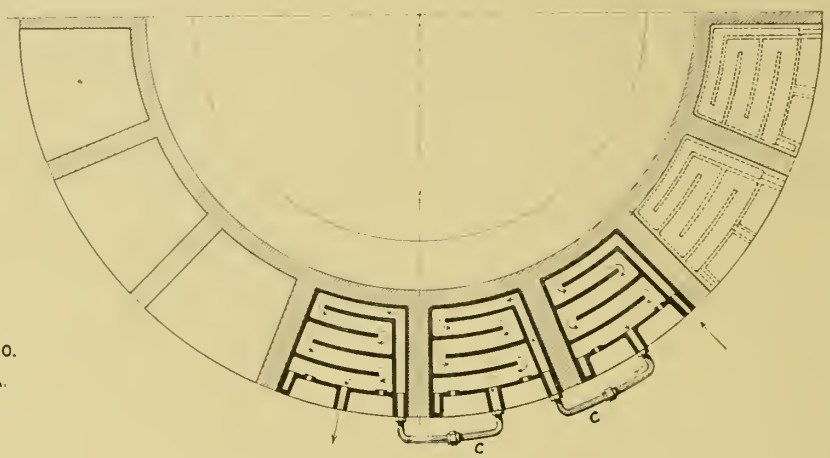
They will enable the furnace to produce more iron, and of a better quality, and on a lower fuel consumption, than by the addition of any other appliance requiring an outlay several times greater.

Yours truly,

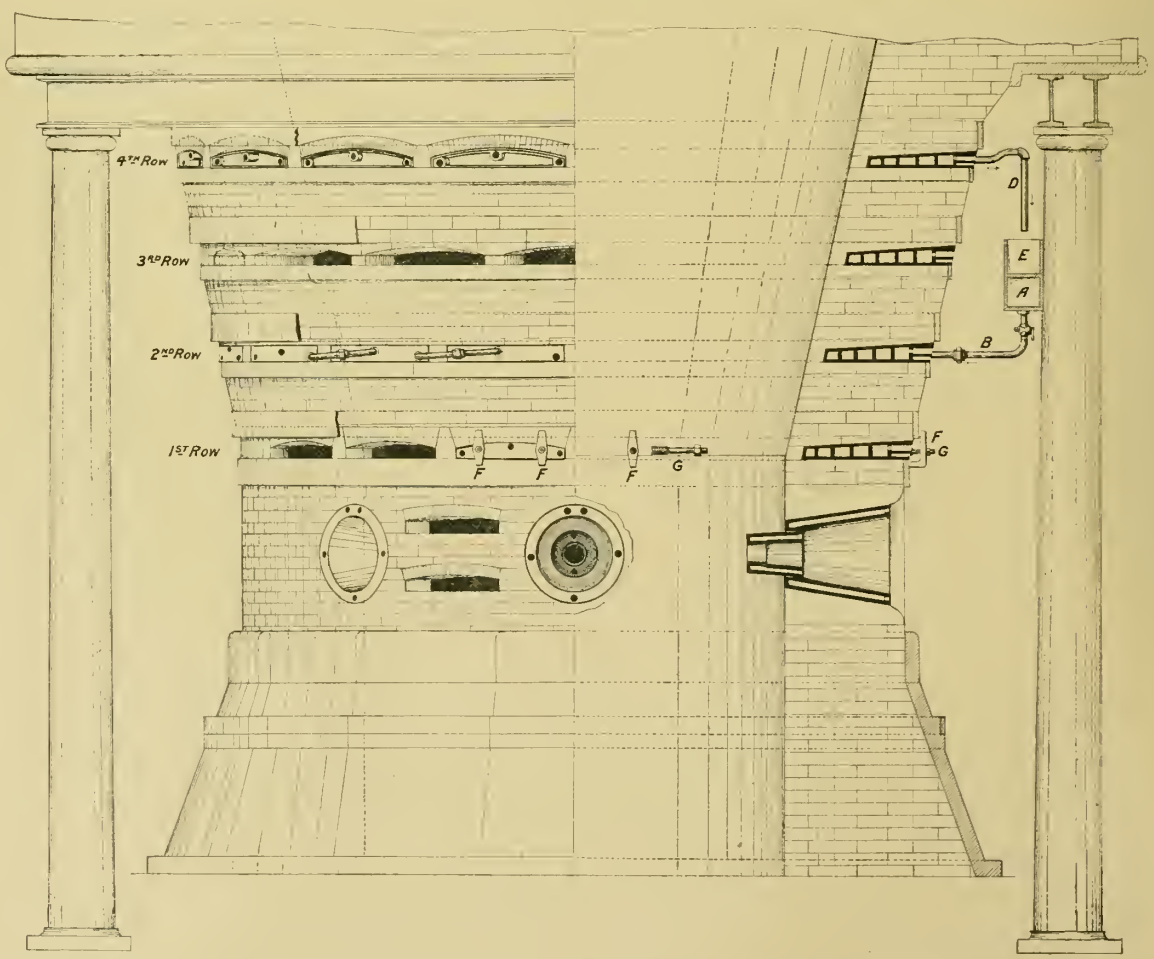
JAMES GAYLEY.

EDGAR THOMSON WORKS,
BRADDOCK, PA.

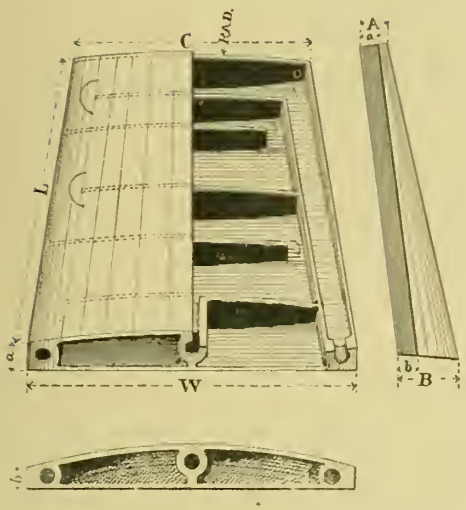
SCOTT'S PATENT BOSH PLATE.



MANUFACTURED BY
BEST, FOX & CO.
PITTSBURGH, PA.



SCOTT'S PATENT BOSH PLATE.



The principal objection offered to bronze plates as made heretofore has been their **cracking or breaking** at point where arms connect with main body of plate, and owing to their size and **difficulty to remove** a plate when necessary. I overcome both objections by making plate smaller with no arms and **constructed tapering** so as to allow ready removal when necessary. This is accomplished by setting clamp bar "F" against furnace, attaching bolt "G" to plate and by turning same, plate is loosened, and readily removed. No more time is required to **change a plate** than that consumed in **changing a Tuyere**. By this means practically no time is lost, no bronze is destroyed and original lines held intact by insertion of new plate. Furnace working irregular, also irregular in product owing to water getting in same, is entirely avoided by removing leaky plate readily **without detriment** to masonry of furnace. Thorough circulation is produced by means of webs as shown. Two, three or four plates can be connected together without detriment to plate serving purpose intended. I prefer using arched plate with brick-work as shown in rows 1 and 4, as weight of bosh is not resting directly on plate. Brick-work, however, can be arranged as shown in row 3, and where objection is offered to arch plate, flat top plate as shown in row 2 can be used and also readily removed, owing to its taper on top and sides. Recesses for receiving plate should be somewhat larger than plate and intervening space lined with clay. Setting plates in this manner admits furnace to **expand and contract freely** without crushing plate and causing them to leak. For the purpose of strengthening bosh, I place bands so as to encircle arches and below bosh plates as shown.

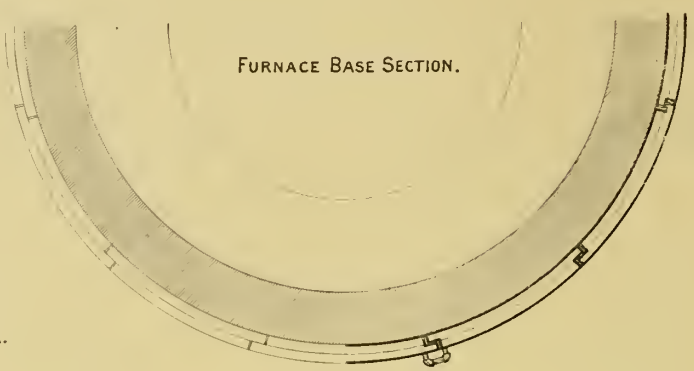
Yours respectfully,

JAMES SCOTT,

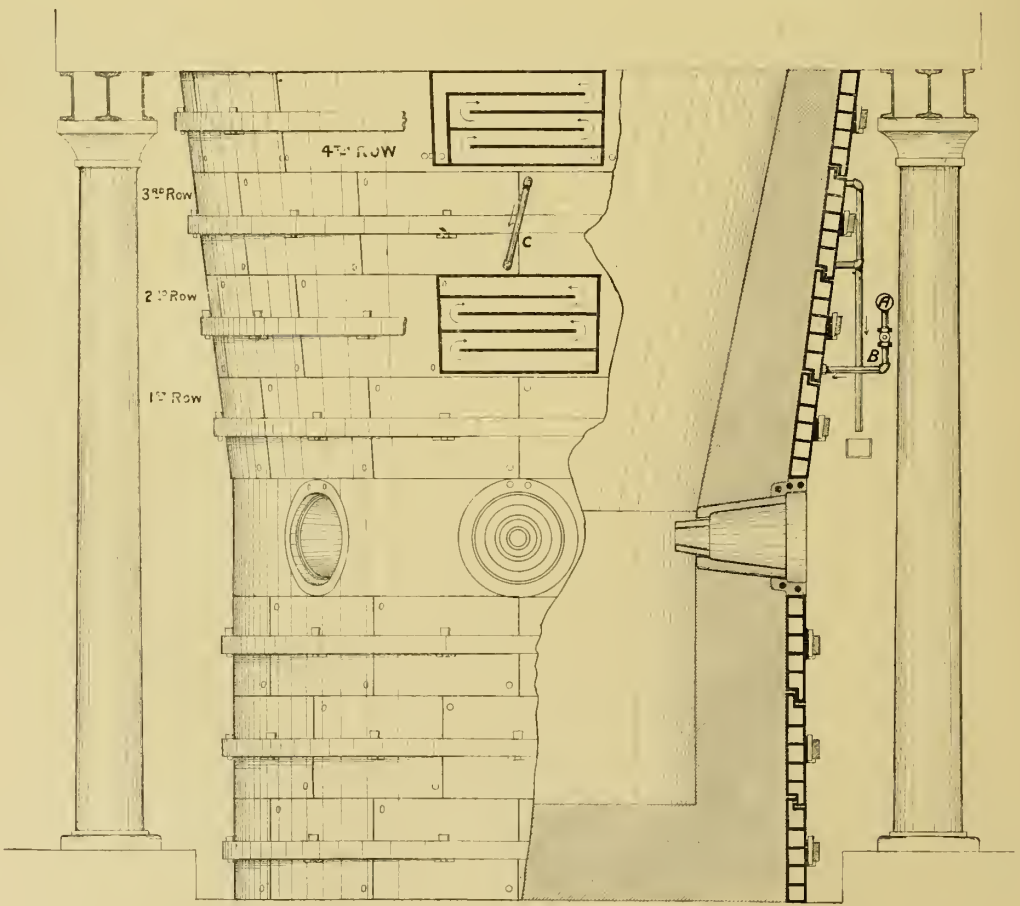
Superintendent Lucy Furnaces,

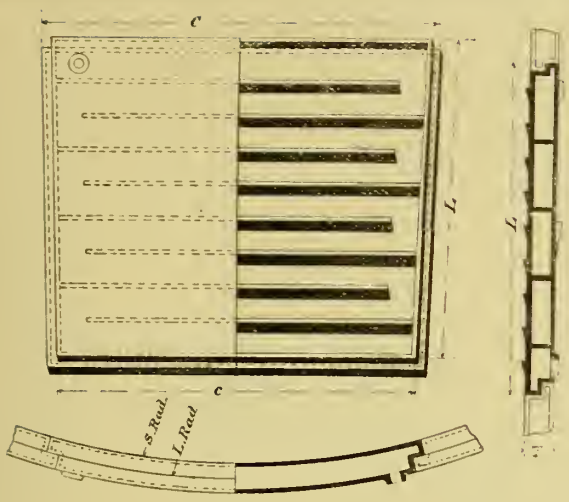
PITTSBURG, PA.

HUNT'S PATENT BOSH JACKET.



MANUFACTURED BY
BEST, FOX & CO.,
PITTSBURG, PA.





HUNT'S PATENT BOSH PLATE.

The accompanying illustration shows my improved design of cooling plate applicable to both bosh and crucible, although more particularly intended for boshes of furnaces, for effectually protecting and cooling the same. One of the principal objections to building *circular plates* in the brick work of the bosh, at regular distances apart vertically, is, that the spaces between these plates, not being subjected to or protected by the cooling influences, are *gradually cut away*, owing to intense heat, *forming ledges* or projections into the furnace. These irregular surfaces or series of scaffolds *prevent* the regular and uniform descent of the stock, and thereby cause irregular working of the furnace with increased consumption of fuel. Bosh walls cut away sooner or later, and any device is objectionable which prevents their wearing away uniformly. My device admits of the building in of the *minimum* amount of *brick work* insideof plates, and the inner wall is gradually and *uniformly* worn away until further wearing or widening of this portion of the furnace is prevented by the cooling effects of these plates. In fact, the plates can be so arranged as to *preserve any given angle* or lines desired.

One of the most effectual outside cooling devices heretofore known is a steel jacket, which, being double riveted, forms a water-tight shell around the bosh and is cooled by a system of sprays, with a water trough at the bottom for collecting the water which flows over its surface. This device is ordinarily ½ to ¾-in. thick and its cooling is dependent upon the amount of water from the sprays, which flow by gravity down its exterior. Hence it cannot be effectually cooled, as steam is formed by the water coming in contact with the hot plate, which prevents a close contact of cold water with it. *All the difficulties* above mentioned *are avoided* with the use of my plate, which is ordinarily constructed, as shown, in sections of rows 1, 2 and 3, in which water enters at lower right hand corner and passing through the tortuous passages as indicated leaves the plate at outlet in upper left hand corner. Sections shown in row 4 have inlet and outlet at bottom to avoid making connections behind mantel.

The entire jacket can be placed on the outside of the brick work of the furnace when completed, or the plates can be erected and firmly banded and keyed and the masonry built inside of same, which latter form is preferred. The object of the interlocking projections top, bottom and sides is to make the *jacket* practically *continuous throughout*, horizontally and vertically, and as strong as a ½ in. to ¾ in. steel jacket. By a luting of fire clay and asbestos, placed on the face of these projections, a *positive* gas and water tight jacket is secured. By constructing the bands which surround the plates of such circumference as to engage the lugs, the keys (which are shown in half section,) may be readily removed and one or more plates can be quickly removed and replaced, should occasion require, and that without affecting the remaining support afforded by any band. Thus no portion of the entire bosh is weakened except the point where the plates are taken out. That this arrangement admits of the *renewal* of a destroyed plate and the replacing of a new one, in a *very short time*, is apparent; and I know of no other outside cooling device which will admit of this.

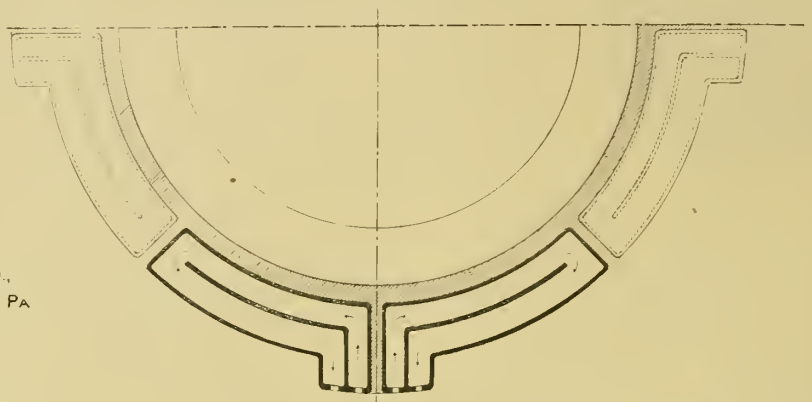
Water connections for these plates can be connected singly or in series of any number, as desired. The two bottom rows that are subjected to the greatest heat can be supplied with separate feeds and discharges if necessary. Lugs, as constructed on the inside of plates for the purpose of intercepting and holding the kish, or graphitic coating mixed with slag, which is deposited on the walls, after the brick work has been worn away, and the furnace can be run on this lining. This device is also particularly adapted to the many copper and lead smelting furnaces which require perfect water cooling plates.

Yours respectfully,

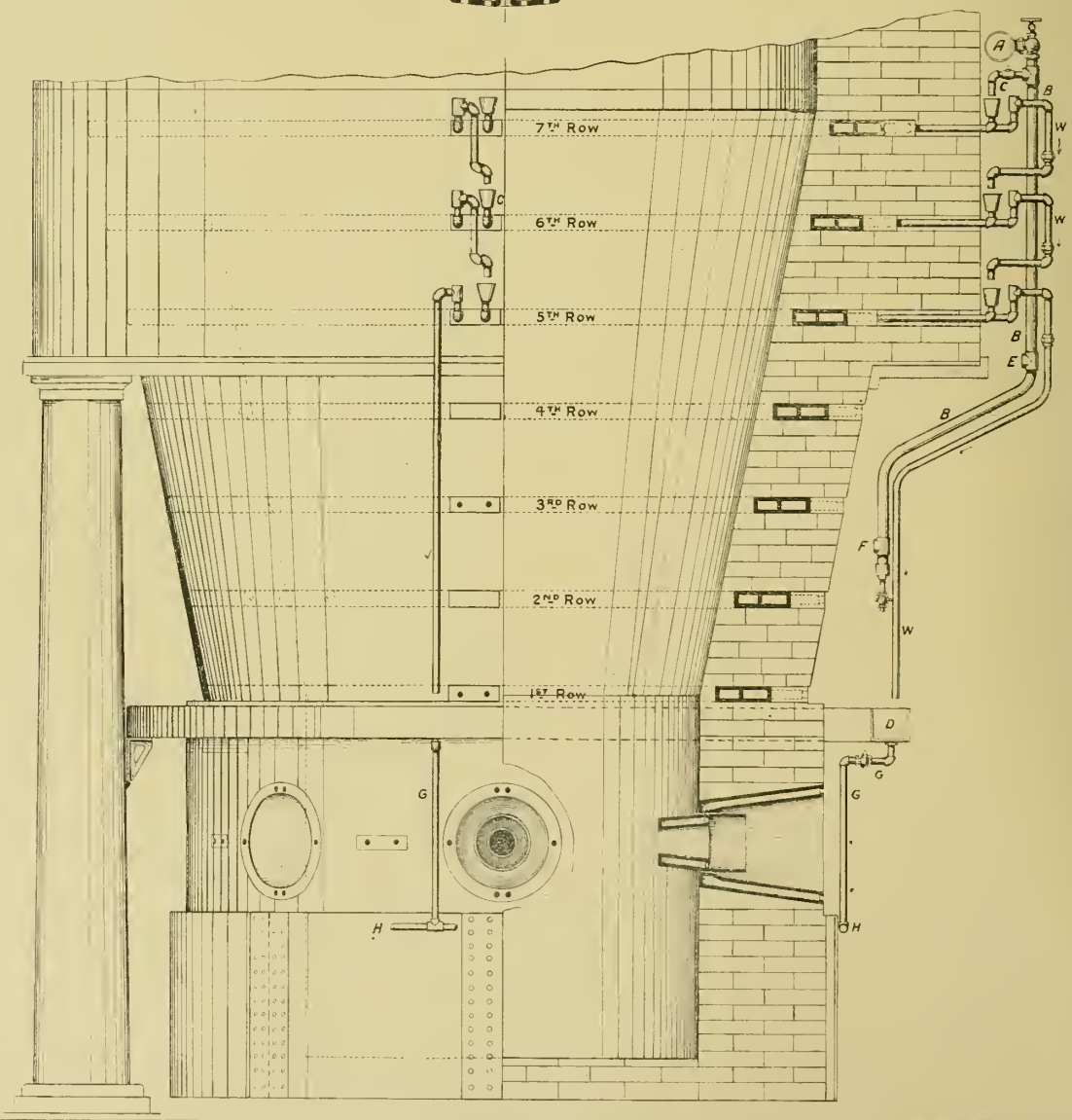
M. R. HUNT.

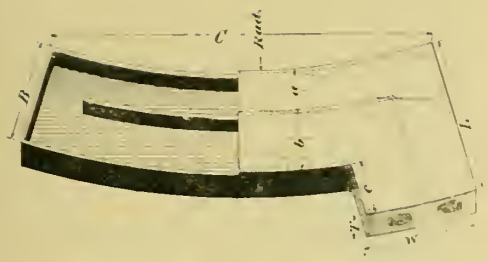
ASHLAND, WIS.

POLLOCK'S PATENT BOSH PLATE.



MANUFACTURED BY
BEST, FOX & CO.,
PITTSBURG, PA





POLLOCK'S PATENT

BOSH PLATE.

My Bosh Plate is a hollow bronze casting with inlet and outlet openings on one end. A partition, as shown, divides the water space, contracting the inner course so as to produce rapid circulation where most needed. The principal advantage derived in connection with my plate is, the method of feeding the water to, and taking it from the plate, with practically no pressure on same, insuring *positively* no water getting into furnace even if the plate so connected should leak. *My patent covers this method of feeding any plate.*

This I accomplish as follows: Water is taken from circular supply pipe A and in place of connecting up solid with plate, the water is allowed to drip into funnel C, elevated above inlet opening 12 inches, as shown. Discharge from plate is carried up 8 inches to tee, open on top, and side opening W is used to convey water to next plate below, and in this manner three or more plates can be supplied from one supply opening, and all without being under pressure.

If any plate should leak it is at once detected by steam and gas coming out of funnel or top of tee, owing to pressure of blast in furnace. To wash out the plate, pressure hose is forced into the funnel and the rapid circulation carries off all sediment. To facilitate piping from circular supply pipe A, a pipe B, with valve next to A is carried down, from which the three upper rows are supplied from first opening, 4th and 3d rows are supplied, from opening E, and 2 lower rows from opening F, with cock on bottom to wash out each drop pipe B.

Water in waste through D can be further used to spray jacket through pipes G and H.

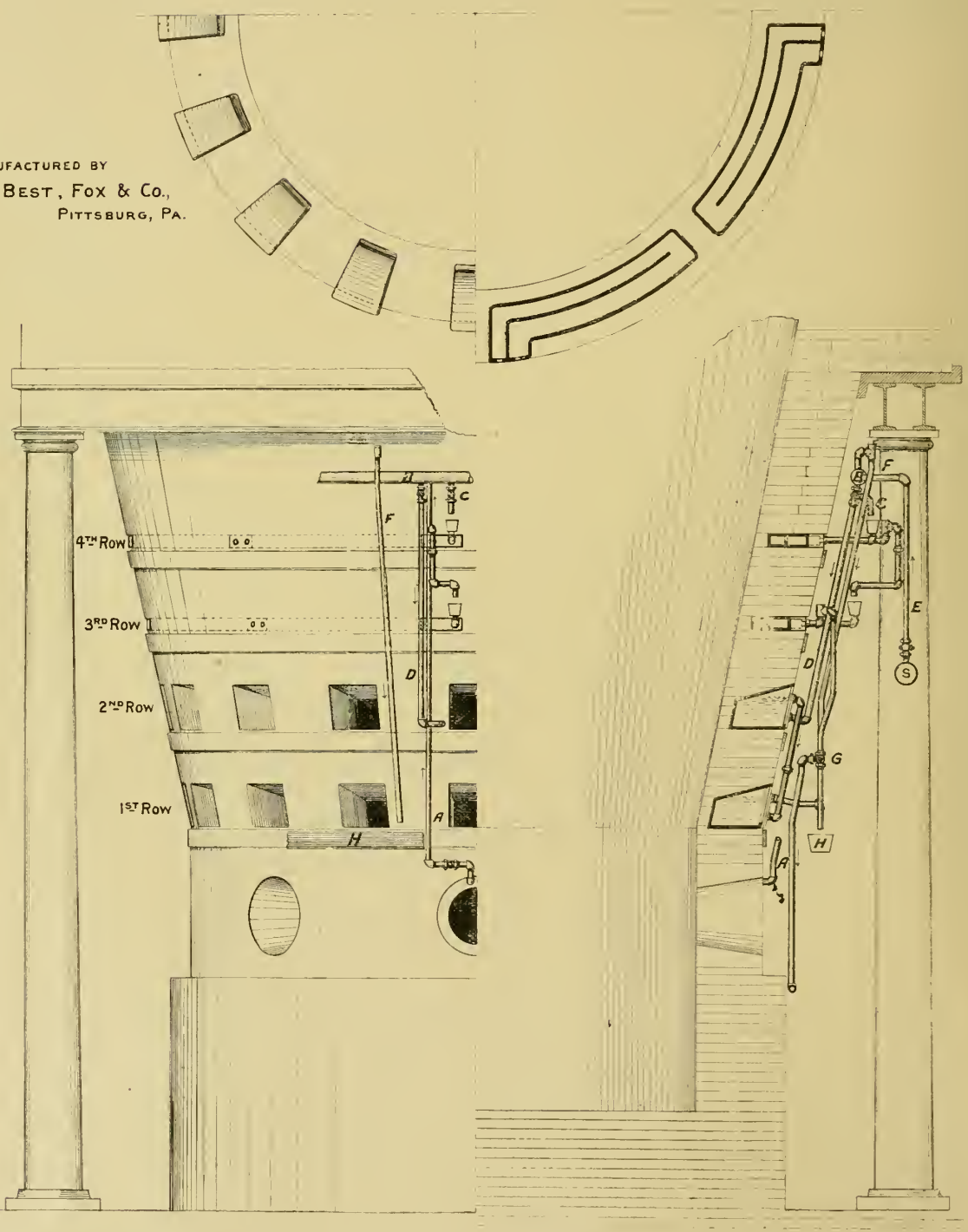
Perfect cooling with least amount of water and the impossibility of any water to get into the furnace is positively obtained with the use of my plate and connections.

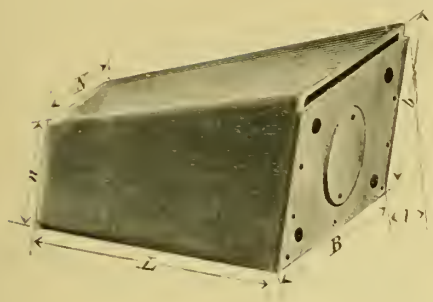
Yours truly,

YOUNGSTOWN, O. T. M. POLLOCK.

FRONHEISER'S PATENT BOSH BOX
COMBINED WITH
POLLOCK'S PATENT BOSH PLATE.

MANUFACTURED BY
BEST, FOX & Co.,
PITTSBURG, PA.





EFFECTIVE BOSH COOLING

OBTAINED BY USING

Waste Water from Tuyere Coolers.

On the opposite side is shown a combination of Bosh Box and Plate Cooling with water NOT under pressure.

Particular attention is called to the system of piping shown, which admits of complete Bosh Cooling (with either Fronheiser Box or Pollock's Plate or both,) without requiring additional water; thereby SAVING STEAM, PUMPS AND PIPING. Where water is scarce this system is of special advantage.

The supply is obtained by utilizing discharge water from Tuyere Coolers. The temperature of the water is but slightly increased after having passed through the Cooler.

The Piping system, as illustrated, is as follows:

A is the discharge pipe from Tuyere Cooler and is connected with circular supply pipe B which is located near the mantel or above Plates or Boxes that are to be fed from it. A cock is placed on the discharge next to Cooler, so as to prevent water from coming back when Cooler requires replacing. If a Three-way Cock is used at this point and connected as shown in Figure F 35, page 96, the volume and temperature of the water can be obtained in an instant. Elevating the discharge from Cooler to circular pipe B will create additional back pressure on the Cooler, but if the bottom of the tank is ten feet higher than the mantel, this back pressure will not be a detriment to the Cooler, as ample circulation is secured. Circular pipe B therefore acts as a receiver for the discharge from Coolers, and at the same time a "head" is obtained for feeding the Cooling devices beneath it. Openings C and D are tapped into pipe B and are used for supply to the Plates and Boxes as shown. The overflow from the first Plate or Box drops into the next beneath it, which in turn overflows and acts as a feed to the one beneath it. The water then overflows into trough H; or by using Three-way Cock G, this waste water, after having done DOUBLE DUTY, can be used for the third time, to spray the hearth jacket as shown.

In case of an accident causing the loss of several Tuyere Coolers at once, and thus greatly reducing the supply to B, sufficient WATER IS OBTAINED through pipe E (which is connected to main circular supply pipe S) by opening cock on this line until the Coolers are replaced.

If the furnace should be working cold, assistance can be given by choking down cocks on feed pipes C and D and allowing water to remain at boiling point in Boxes or Plates.

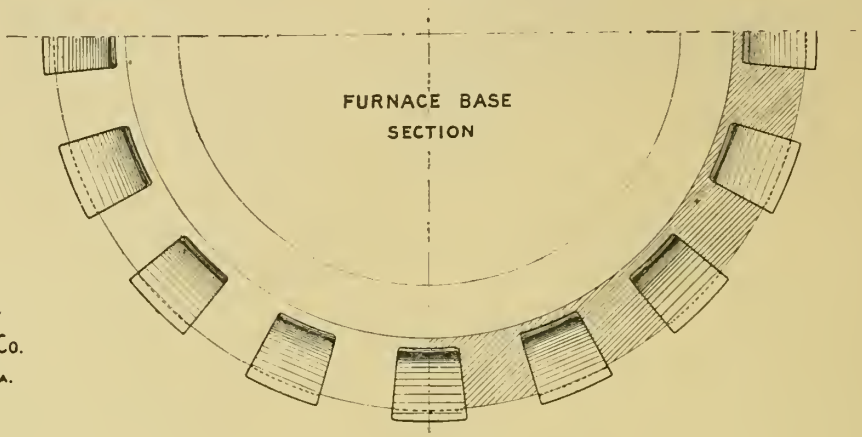
The question may be asked: Does not this choking down increase back pressure on Coolers to such an extent that there is danger of burning them? Such would be the result if provision for removing this excess pressure from circular pipe B was not provided for, through overflow pipe F, which conveys the excess water from B to waste trough H.

AMPLE PROVISION therefore is provided for all emergencies; making the entire system as reliable and safe as though the supply was obtained from tank pressure direct.

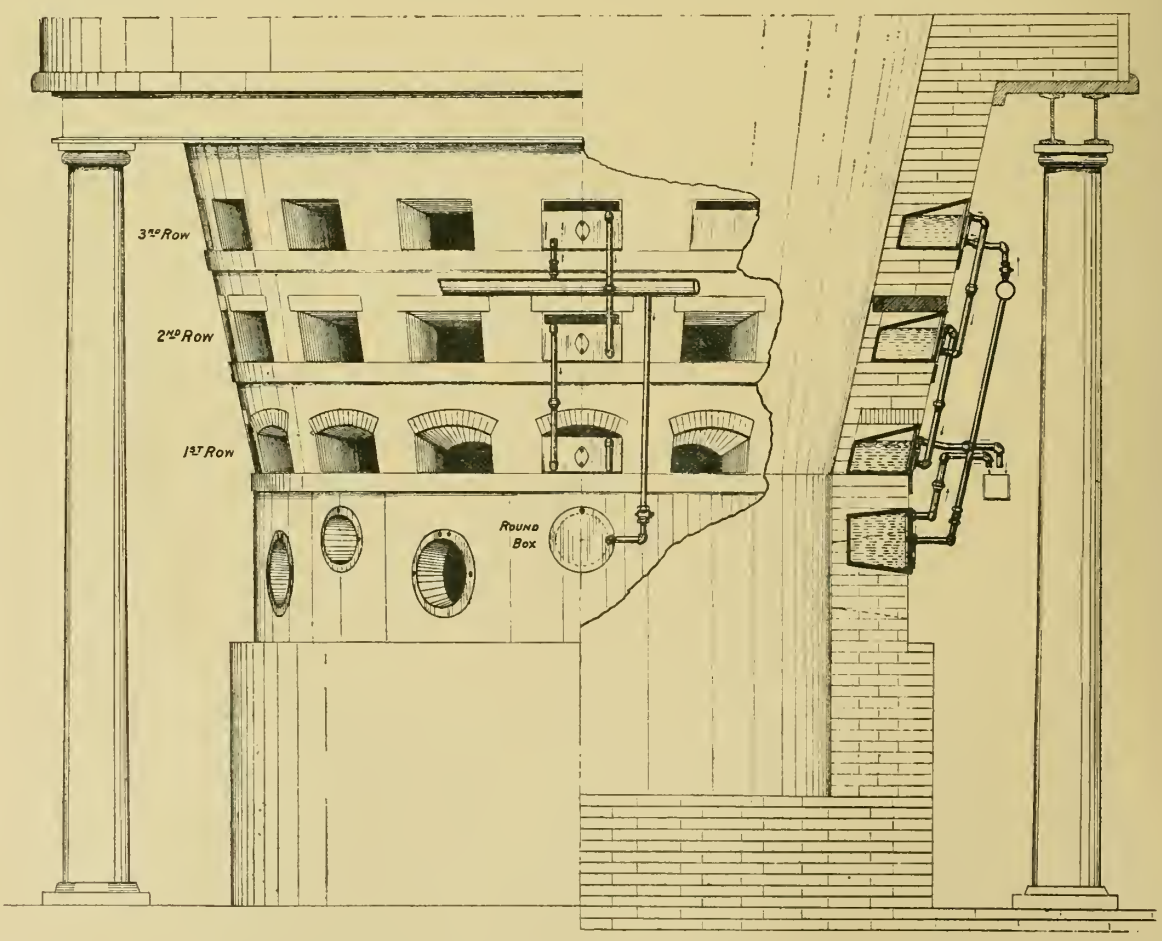
This system of piping has been in satisfactory use for years at several furnaces in various sections of the country.

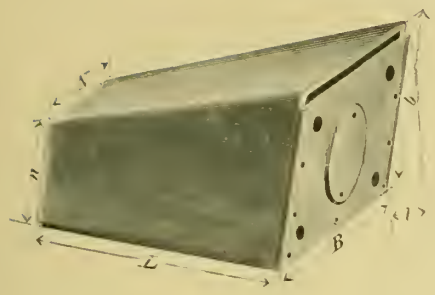
We have experienced men to do this work and guarantee satisfaction in every particular.

FRONHEISER'S PATENT BOSH BOX.



MANUFACTURED BY
BEST, FOX & CO.
PITTSBURGH, PA.





FRONHEISER'S PATENT BOSH-BOX.

Advantages of Cooling Bosh by Use of Patented Bosh Boxes.

1. Positive and easy detection of leaks, as the water is not under pressure but overflows, and the back of the box being open at the top, STEAM AND GAS WILL DEVELOP at this point in case of leak.

2. EASY REMOVAL WHEN NECESSARY, as the box is made tapering on sides and top for this purpose. Round boxes tapered same as Tuyeres, or square boxes with arch top are also made for this purpose. (See page 44.)

3. ECONOMY in the USE of WATER, as the capacity of a 1½ inch pipe is sufficient to supply a tier of six (6) or eight (8) boxes, the water overflows from upper box to one below, and this in turn to next, until bottom is reached.

4. ACTUAL EXPERIENCE has proven that original bosh lines are held intact by the use of these boxes. A continuous blast of FOUR YEARS, with a production exceeding 300,000 tons, have been made, with no serious slipping or irregular working, and a low fuel consumption no greater the FOURTH YEAR than the FIRST; the blast being brought to a close by the inwall of the furnace, giving away 10 ft. above the bosh, the hearth and bosh being but a few inches larger than when the furnace was first blown in.

5. The saving in fuel for one year will pay for a set of boxes, and their use makes the bosh practically indestructible. Owing to the large amount of water they contain, they cannot be destroyed by a stoppage of water of more than three times the length of time that would destroy any other device in use, allowing ample time to correct the trouble. If for any reason the furnace has to be relined, the boxes can be reset and used time after time.

6. By means of a hand hole plate, which can readily be removed, the inside of box can be reached and thoroughly cleaned.

7. The LARGE VOLUME of WATER has a COOLING EFFECT not obtained by the water circulating through pipe or small space. Any portion of the bosh can be cooled more or less at will.

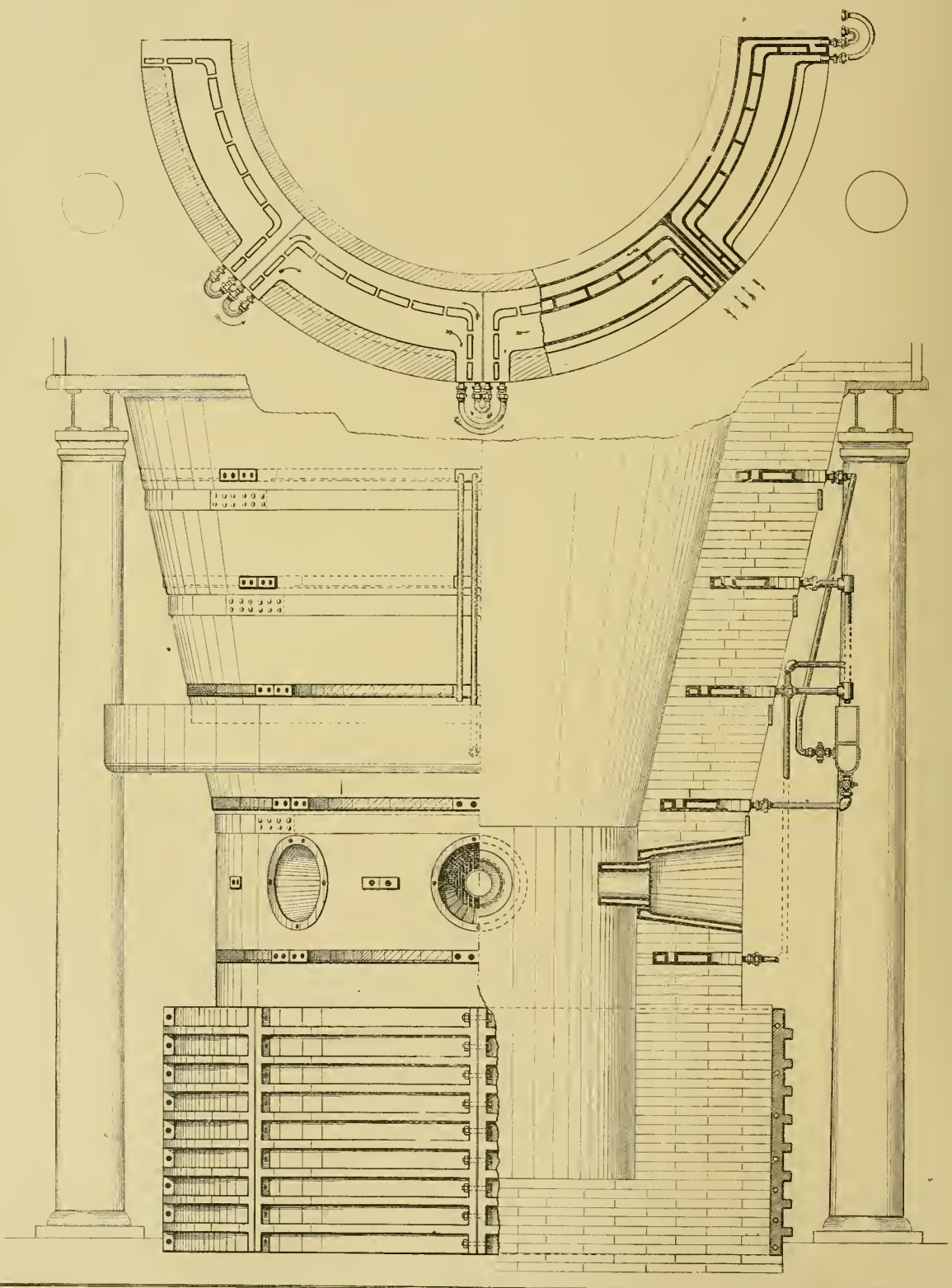
8. The thickness of bosh walls can be materially reduced by the use of these boxes. Several 18 ft. furnaces have reduced their walls from 27 in. to 21 in., thereby making a material reduction in the original COST of brick and bronze work, and an INCREASED OUT-PUT, owing to a foot large diameter in the hearth and bosh without shortening the life of the furnace.

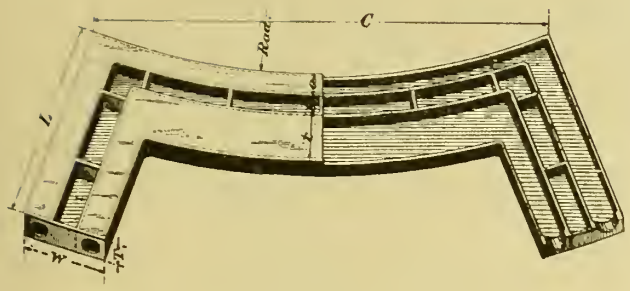
9. The actual cost of a set of bronze bosh boxes is but a trifle over the cost of IRON PLATES or PIPES, allowance for scrap taken into consideration, not considering the increased life of bronze over iron.

Yours truly,

JOHNSTOWN, PA. J. J. FRONHEISER.

KENNEDY'S PATENT BOSH PLATE.





KENNEDY'S PATENT BOSH-PLATE.

Owing to iron pipe in old style of Bosh-plate corroding and choking up, a pipe made of copper was bent and cast in iron Bosh-plate with satisfactory results. When furnace was blown out metal was entirely gone and copper pipe found hanging down inside of furnace, proving this or its equivalent was the proper material to make Bosh-plates of, and from this experiment the above style of plate was designed.

The advantages obtained are: No corrosion, wide water-ways giving effective cooling, and with long arms at ends of plate. Tilting of plate is avoided. The double water way gives opportunity of using the outside course in case the inner one is destroyed, and with this hold the lines intact. Plates can be made with single or triple water ways, also with arm on one end only.

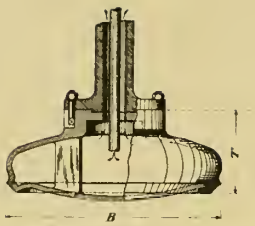
This was the first Bosh-plate made of climax bronze in 1886 and was put in

The Lucy Furnaces, Pittsburg, Pa.,	2	Furnaces.
EdgarThomson " Bessemer, "	8	"
Isabella " Pittsburg, "	2	"
Joliet Steel Co., Joliet, Ills.,	2	"
Maryland Steel Co., Sparrows Point, Md.,	4	"
Monongahela Furnaces, McKeesport, Pa.,	2	"

Palmer Ship Building Co., Jarrow, Eng.

Bristol Iron & Steel Co., Bristol, Tenn.

VALVES.



DESCRIPTION.

B—Outside diameter.

T—Thickness large end.

t—Thickness small end.

VALVES.

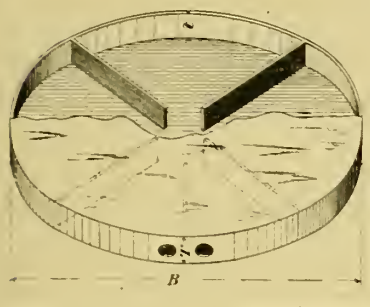
CLASS B.

No.	*B*	*T*	*t*	*Wt.*	*Cypher.*
105	24¾	9	...	292	Canteen

Several cooling devices are numbered but not illustrated, as will be seen by referring to numerical index.

Special cooling devices made to order.

VALVES.



DESCRIPTION.

B—Outside diameter.

T—Thickness large end.

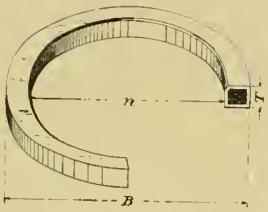
t—Thickness small end.

VALVES.

CLASS A.

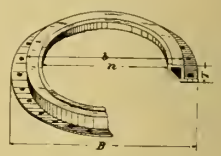
No.	*B*	*T*	*t*	*Wt.*	*Cypher.*
413	20 1/4	3 1/2	3	135	Breeder
415	38 3/4	4 3/8	4	502	Brennage
533	23	3 1/4	2 7/8	165	Burbot

VALVE SEATS.



DESCRIPTION.

n—Inside diameter.
b—Outside diameter of water space.
B—Outside diameter over all.
T—Thickness.



VALVE SEATS.

CLASS E.

No.	*n*	*B*	*T*	*Wt.*	*Cypher.*
388	24	30	3	154	Boyuna
438	36	42	3	216	Brimmer

CLASS F.

No.	*n*	*b*	*B*	*T*	*Wt.*	*Cypher.*
412	18¾	24¼	27½	2⅝	112	Breccia
414	37	44	47½	3½	269	Brehon

VALVE SEATS.

DESCRIPTION.

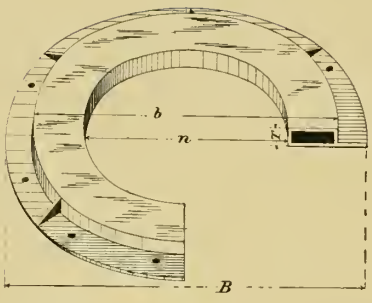
n—Inside diameter.
b—Outside diameter of water space.
B—Outside diameter over all.
T—Thickness.

VALVE SEATS.

CLASS G.

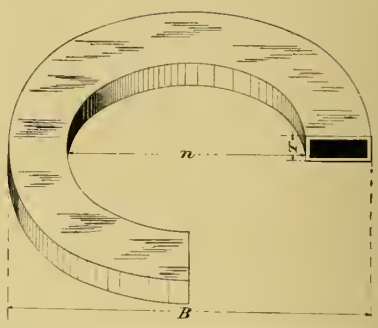
No.	*n*	*B*	*T*	*Wt.*	*Cypher.*
418	22	27	2 1/2	85	Brettice
424	24	28	2 1/2	100	Brewis
597	30	34 1/8	2 5/8	82	Cachunde

VALVE SEATS.



DESCRIPTION.

n—Inside diameter.
b—Outside diameter water space.
B—Outside diameter over all.
T—Thickness.



VALVE SEATS.

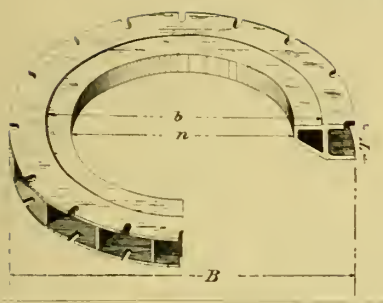
CLASS A.

No.	*n*	*b*	*B*	*T*	*Wt.*	*Cypher.*
39	30	40½	47	2½	326	Alter
81	24	36⅜	43	2¼	335	Babe
93	26	37	43	2½	285	Bacule
300	24	44	50½	3⅜	606	Blanket
680	15	21	36	2⅞	235	Camphor

CLASS B.

No.	*n*	*B*	*T*	*Wt.*	*Cypher.*
137	30	47	2½	345	Bandoleer
199	26	43	2½	329	Batter
487	24	49⅝	3	592	Buckeye

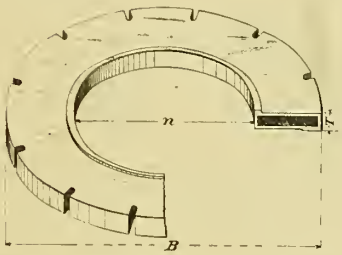
VALVE SEATS.



BERG'S PATENT.

DESCRIPTION.

n—Inside diameter.
b—Outside diameter of water space.
B—Outside diameter over all.
T—Thickness.



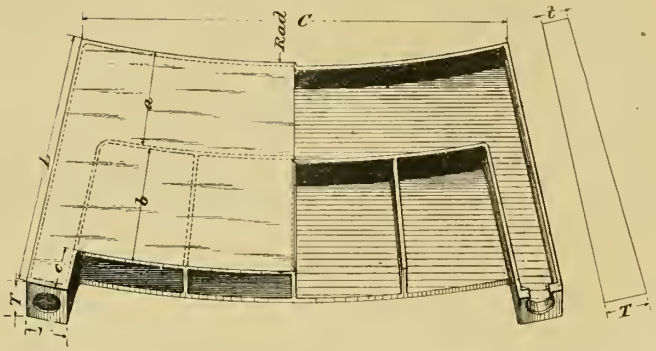
VALVE SEATS.

CLASS C.

No.	*n*	*b*	*B*	*T*	*Wt.*	*Cypher.*
66	26	33¼	40½	4¼	495	Atlas
200	30	37½	44½	4¼	485	Battle
228	30	36	42	5½	430	Beck
229	24	29½	37½	5½	382	Becket
329	18	25	32½	4¼	350	Boatman
437	24	33	40	4	460	Brilliant
492	24	31½	38¼	4¼	400	Budge
580	24	32½	40	4⅞	492	Cabaret
618	30	35½	43	4¼	483	Calabash
620	22	31½	36	4⅛	403	Calamar
624	24	32	40	4⅞	441	Calandra
720	28	33¼	41	4¼	387	Caprifole
724	30	37½	44½	4½	456	Captain

CLASS D.

No.	*n*	*B*	*T*	*Wt.*	*Cypher.*
490	22	39	3	304	Buckskin



BOSH PLATES

CLASS G.

GAYLEY'S PATENT.

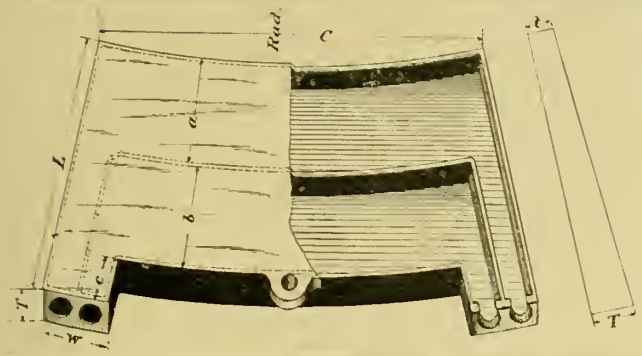
Nov. 24, 1891.

DESCRIPTION.

Rad—Radius of plate.
C—Chord.
L—Length of arm.
W—Width.
t—Thickness at nose.
T—Thickness at butt.
a—Width of inner water course.
b—Width of outer water course.
c—Length of arm outside of water course.

BOSH PLATES, CLASS G.

No.	*Rad.*	*C*	*L*	*W*	*t*	*T*	*a*	*b*	*c*	*Wt.*	*Cypher.*
495	6 ft. 6 in.	2 ft. 10 in.	27	2 7/8	2 1/2	4	10 1/2	12 1/2	4	265	Buffalo
531	7 ft. 7 1/2 in	3 ft. 4 1/4 in	27	2 7/8	2 1/2	4	10 1/2	12 1/2	4	332	Bunyon
532	8 ft. 1 1/2 in.	3 ft. 7 1/8 in.	27	2 7/8	2 1/2	4	10 1/2	12 1/2	4	340	Buoy
571	7 ft. 1 1/2 in.	2 ft. 11 in	27	2 7/8	2 1/2	4	10 1/2	12 1/2	4	303	Buyer
572	9 ft. 1 1/2 in.	4 ft. 2 1/2 in	27	2 7/8	2 1/2	4	10 1/2	12 1/2	4	383	Buzzard
577	4 ft. 8 in.	2 ft. 1 1/8 in.	22	3	2 1/2	4	10 1/2	7	4	183	Cabalist
578	5 ft. 0 in.	2 ft. 3 1/4 in.	17 1/2	3	2 1/2	4	10 1/2	2 1/2	4 1/2	133	Caballer
601	5 ft. 8 1/4 in	2 ft. 3 in.	25 1/2	3	2 1/2	4 1/4	10 1/2	10 1/2	4 1/8	215	Caddy
602	2 ft. 5 in.	2 ft. 4 in.	12	2 1/2	2 1/2	3	6 5/8	5 3/8	...	125	Cadet
603	2 ft. 5 in.	2 ft. 6 in.	12	2 1/2	2 1/2	3	6 5/8	5 3/8	...	125	Cadillac
604	3 ft. 6 in.	2 ft. 7 in.	12	2 1/2	2 1/2	3	6 5/8	5 3/8	...	105	Cadmia
605	3 ft. 6 in.	2 ft. 8 in.	12	2 1/2	2 1/2	3	6 5/8	5 3/8	...	119	Caduceus
608	5 ft. 7 1/2 in.	2 ft. 5 in.	27	2 7/8	2 1/2	4	10 1/2	12 1/2	4	246	Cagit
617	6 ft. 4 1/2 in	2 ft. 6 1/4 in	30	2 7/8	2 1/4	4	13 1/2	12 1/2	4	282	Cajoler
668	4 ft. 10 in.	2 ft. 3 5/8 in	18	2 7/8	3	4	10 1/2	5 1/2	2	172	Camel
669	5 ft. 4 in.	2 ft. 6 1/2 in	18	2 7/8	3	4	10 1/2	5 1/2	2	179	Cameleopard
670	5 ft. 11 in.	2 ft. 11 in.	18	2 7/8	3	4	10 1/2	5 1/2	2	200	Cameo
679	6 ft. 0 in.	2 ft. 1 in.	27	2 7/8	2 1/2	4	10 1/2	12 1/2	4	238	Camphene
729	6 ft. 4 1/2 in.	2 ft. 6 1/4 in	26	2 7/8	2 1/4	4	13 1/2	12 1/2	...	285	Caracal



BOSH PLATES

CLASS H.

GAYLEY'S PATENT.

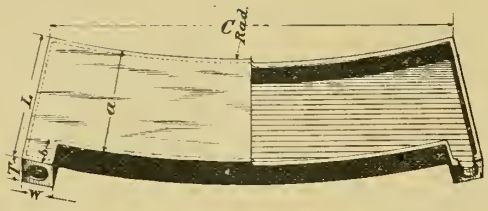
May 24, 1891.

DESCRIPTION.

Rad.—Radius of plate.
C—Chord.
L—Length of arm.
W—Width of arm.
T—Thickness.
a—Width of inner water course.
b—Width of outer water course.
c—Length of arm outside of water course.

BOSH PLATES, CLASS H.

No.	*Rad.*	*C*	*L*	*W*	*t*	*T*	*a*	*b*	*c*	*Wt.*	*Cypher.*
543	7 ft. 0 in.	3 ft. 0 in.	27	6½	2½	4	10½	12½	4	353	Burgonet



BOSH PLATES

CLASS E

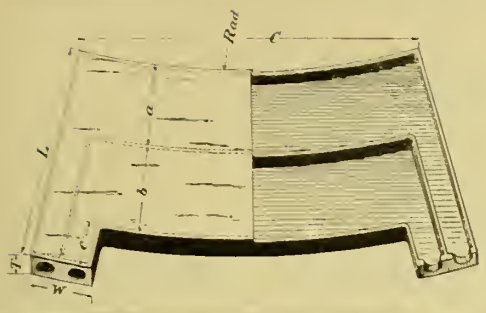
All Weights given are Approximate.

DESCRIPTION.

Rad.—Radius of plate.
C—Chord.
L—Length of arm.
W—Width of arm.
T—Thickness.
a—Width of water course.
b—Length of arm outside of water course.

BOSH PLATES CLASS E.

No.	*Rad.*	*C*	*L*	*W*	*T*	*a*	*b*	*Wt.*	*Cypher.*
563	7 ft. 1 in.	3 ft. 4 in.	13	3	2⅞	11	2	158	Buster
564	7 ft. 9 in	3 ft. 8¼ in.	13	3	2⅞	11	2	173	Butcher
565	8 ft. 5 in.	4 ft. ⅜ in.	13	3	2⅞	11	2	182	Butler
628	5 ft. 6 in.	1 ft. 8 in.	13	3	2¼	11	2	83	Calcimine
629	5 ft. 9 in	3 ft. 10¼ in.	13	3	2¼	11	2	154	Calculator
630	6 ft. 1 in.	4 ft. 1¼ in.	13	3	2¼	11	2	160	Calculus
631	6 ft. 7 in.	4 ft. 6 in.	13	3	2¼	11	2	185	Caldron
632	7 ft. 1½ in	4 ft. 11 in.	13	3	2¼	11	2	199	Calender
633	7 ft. 7½ in.	5 ft. 3½ in	13	3	2¼	11	2	220	Calendula
634	9 ft. 2 in	4 ft. 2 in.	13	3	2⅛	11	2	182	Calenture
635	9 ft. 8 in	4 ft. 5 in.	13	3	2⅞	11	2	195	Calf
656	6 ft. 1½ in.	2 ft. 6½ in.	12	...	3½	12	...	121	Calumet
667	4 ft. 7½ in.	1 ft. 9 in.	18	3¼	2¼	14	4	130	Cambric
671	7 ft. 6 in.	2 ft. 11 in.	18	3¼	2¼	16	2	175	Camera
696	4 ft. 7½ in.	2 ft. 9 in	18	3¼	2¼	14	4	163	Cannister
708	7 ft. 6 in.	2 ft. 11 in	40	6	2¼	16	24	265	Canton
709	7 ft. 6 in.	2 ft. 11 in.	31	6	2¼	16	15	224	Canvas
710	9 ft. 2 in.	4 ft. 2 in.	27	6	2⅛	11	16	241	Canvasser



BOSH PLATES

CLASS F.

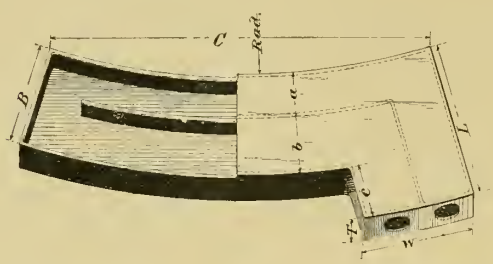
All Weights given are Approximate.

DESCRIPTION.

Rad.—Radius of plate.
C—Chord.
L—Length of arm.
W—Width of arm.
T—Thickness.
a—Width of inner water course.
b—Width of outer water course.
c—Length of arm outside of water course.

BOSH PLATES. CLASS F.

No.	*Rad.*	*C*	*L*	*W*	*T*	*a*	*b*	*c*	*Wt.*	*Cypher.*
493	5 ft. 10½ in.	2 ft. 5 in.	27	6½	2¼	11½	11½	4	255	Budger
494	5 ft 10½ in	4 ft. 0 in	27	6½	2¼	11½	11½	4	400	Budlet
541	6 ft. 6½ in	2 ft. 5 in.	33	6½	2¼	11½	11½	10	280	Burgher
542	6 ft. 6½ in.	4 ft. 0 in.	33	6½	2¼	11½	11½	10	420	Burglar
616	5 ft. 10½ in.	2 ft. ⅝ in.	27	6½	2¼	11½	11½	4	211	Cajeput
619	5 ft. 0 in	1 ft. 4 in.	27	6½	2¼	11¼	11¼	4½	153	Calade
641	5 ft 10½ in	3 ft. 8½ in.	27	6½	2¼	11½	11½	4	341	Calipee



BOSH PLATES.

CLASS C

POLLOCK'S PATENT.

April 21, 1891.

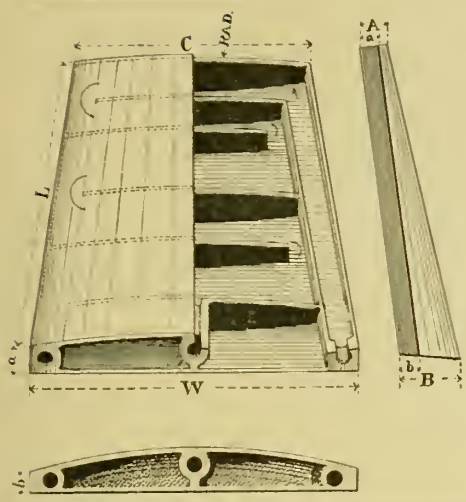
All Weights given are Approximate.

DESCRIPTION.

Rad—Radius of plate.
C—Chord.
L—Length of arm.
B—Width of plate.
W—Width of arm.
T—Thickness.
a—Width of inner water course.
b—Width of outer water course.
c—Length of arm outside of water courses.

BOSH PLATES, CLASS C.

No.	*Rad.*	*C*	*L*	*B*	*W*	*T*	*a*	*b*	*c*	*Wt.*	*Cypher.*
451	5 ft. 9 in.	2 ft. 10 in.	18	13	12	3	5½	7½	5	179	Brodekin
452	6 ft. 4½ in.	4 ft. 8½ in.	18	13	12	3	5½	7½	5	279	Brogan
453	7 ft. 0 in.	5 ft. 2 in.	18	13	12	3	5½	7½	5	321	Broiler
454	7 ft. 9 in.	5 ft. 9½ in.	18	13	12	3	5½	7½	5	340	Broker
455	8 ft. 5 in.	6 ft. 3½ in.	18	13	12	3	5½	7½	5	375	Broma
456	9 ft. 0 in.	6 ft. 8½ in.	18	13	12	3	5½	7½	5	370	Bromate
457	9 ft. 7 in.	7 ft. 2 in.	18	13	12	3	5½	7½	5	435	Bromide
458	10 ft. 1½ in.	7 ft. 7 in.	18	13	12	3	5½	7½	5	450	Bromuret
625	5 ft. 10½ in.	4 ft. 3 in.	18	13	12	3	5½	7½	5	240	Calangay
626	5 ft. 3 in.	3 ft. 9 in.	18	13	12	3	5½	7½	5	212	Calash
627	5 ft. 3 in.	2 ft. 4 in.	18	13	12	3	5½	7½	5	146	Calcar



BOSH PLATES.

CLASS D

SCOTT'S PATENT.

May 19, 1891.

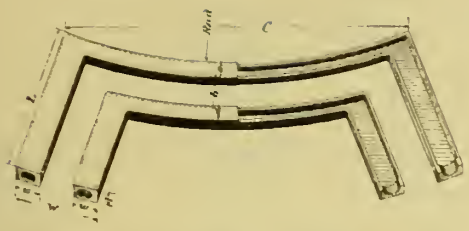
All Weights given are Approximate.

DESCRIPTION.

Rad—Radius of plate.
C—Chord.
L—Length.
a—Short height at nose.
A—Long height at nose.
b—Short height at butt.
B—Long height at butt.
W—Width outside.

BOSH PLATES CLASS D.

No.	*Rad.*	*C*	*L*	*a*	*A*	*b*	*B*	*W*	*Wt.*	*Cypher.*
496	5 ft. 11 in.	1 ft. 4⅝ in	31	2¼	3	2¼	4¼	27	222	Buffer
497	6 ft. 5 in.	1 ft. 6¼ in.	31	2¼	3¼	2¼	4½	28½	244	Buffeter
498	6 ft. 10 in.	1 ft. 8 in.	31	2¼	3⅜	2¼	4⅞	30⅜	257	Buffin
499	7 ft. 3½ in.	1 ft. 10 in	31	2¼	3½	2¼	5¼	32¼	287	Buffoon
587	6 ft. 8½ in.	1 ft. 6 in.	21	1⅞	3	2¼	4	22⅝	135	Cablet
588	7 ft. 10¼ in.	1 ft. 6½ in	21	1⅞	3	2¼	4	22⅝	142	Cabob
641	7 ft. 9½ in.	2 ft. 0 in.	25	2¼	3¾	2¼	5¼	32¼	230	Caliver
645	7 ft. 2 in.	1 ft. 9¼ in.	27	2¼	3½	2¼	4⅞	30⅜	221	Calker
648	6 ft. 7 in.	1 ft. 7 in.	29	2¼	3¼	2¼	4½	28½	217	Calliope
661	5 ft. 9 in.	1 ft. 7 in.	27	2¼	3¼	2¼	4¾	29	198	Calyon
663	5 ft. 4½ in.	1 ft. 11 in.	18	2¼	3¾	2¼	4¾	29½	153	Camaien
666	5 ft. 4½ in.	1 ft. 11 in.	22½	2¼	3¾	2¼	5	30⅝	196	Cambist
672	5 ft. 4½ in.	1 ft. 11 in	12	2¼	3¾	2¼	4½	27⅜	109	Camion
684	9 ft. 2 in.	3 ft. ⅝ in.	21	1¾	3⅛	2	4	43¾	268	Canaster
703	6 ft. 9½ in.	1 ft. 7 in.	22½	2¼	3 7/16	2¼	4¾	27¾	168	Canopy
711	5 ft. 4½ in.	1 ft. 11 in.	21	2¼	3¾	2¼	5	30⅝	185	Canyon
712	6 ft. 6 in.	1 ft. 11 in.	18	2¼	3¾	2½	4¾	28¼	156	Capelan
713	6 ft. 9½ in.	1 ft. 7 in.	22½	2¼	3½	2¼	4¾	27¾	165	Capias
727	6 ft. 1½ in.	1 ft. 4⅞ in.	13½	2¼	3½	2¼	4	20	81	Capture



BOSH PLATES.

CLASS B

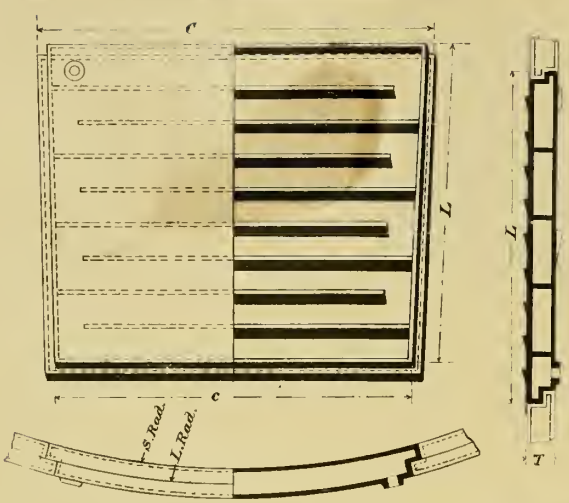
All Weights given are Approximate.

DESCRIPTION.

Rad—Radius of plate.
C—Chord.
L—Length of arm.
a—Width of each arm.
W—Width of two arms and space.
T—Thickness.
a—Width of water courses
b—Width of space between courses.

BOSH PLATES, CLASS B.

No.	*Rad.*	*C*	*L*	*a*	*W*	*T*	*a*	*b*	*Wt.*	*Cypher.*
521	7 ft. 0 in.	5 ft. 2 in.	22½	3½	12	2¼	3½	5	112	Bumboat
521A	7 ft. 8½ in.	4 ft. 4½ in.	14	3½	12	2¼	3½	5	84	Bumboat
522	6 ft. 7 in.	4 ft. 11 in.	22½	3½	12	2¼	3½	5	110	Bumkin
522A	7 ft 3½ in	4 ft. 1¼ in.	14	3½	12	2¼	3½	5	83	Bumkin
523	6 ft. 2¼ in.	4 ft. 7 in.	22½	3½	12	2¼	3½	5	110	Bummer
523A	6 ft. 10¾ in.	3 ft. 9¼ in.	14	3½	12	2¼	3½	5	77	Bummer
524	5 ft. 9¼ in	4 ft. 3 in.	22½	3½	12	2¼	3½	5	106	Bump
524A	6 ft. 5½ in.	3 ft. 5½ in.	14	3½	12	2¼	3½	5	73	Bump
525	5 ft. 4½ in	3 ft. 4 in.	22½	3½	12	2¼	3½	5	91	Bumper
525A	6 ft. 1 in	2 ft. 4¾ in	14	3½	12	2¼	3½	5	57	Bumper
526	5 ft. 4½ in.	1 ft. 6 in	22½	3½	...	2¼	3½	...	64	Bunch



HEARTH AND BOSH JACKETS.

HUNT'S PATENT.

May 19, 1891.

All Weights g ven are Approximate.

DESCRIPTION.

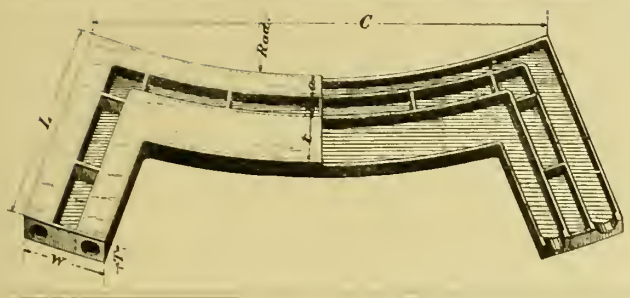
S Rad—Short radius.
L " —Long "
C—Long chord.
c—Short "
L—Length.
T—Thickness.

HEARTH JACKET.

No.	*S. Rad.*	*L. Rad.*	*C*	*c*	*L*	*T*	*Wt.*	*Cypher.*
58	4 ft. 4 in.	4 ft. 1 in.	3 ft. 9 in.	3 ft. 6 in.	20	2¼	222	Arch

BOSH JACKET.

No.	*S. Rad.*	*L. Rad.*	*C*	*c*	*L*	*T*	*Wt.*	*Cypher.*
286	5 ft. 3 in.	5 ft. 6½ in.	2 ft. 8¾ in.	2 ft. 7¼ in.	2 ft. 1½ in.	2½	253	Birrus
287	5 ft. 6½ in.	5 ft. 9½ in.	2 ft. 8 in.	2 ft. 6½ in.	do	do	279	Biscotin
288	5 ft. 9½ in.	6 ft. ½ in.	2 ft. 7¼ in.	2 ft. 6 in.	do	do	300	Biscuit
289	6 ft. ½ in.	6 ft. 3½ in.	2 ft. 6½ in.	2 ft. 5¼ in.	do	do	322	Bishop



BOSH PLATES.

CLASS A

KENNEDY'S PATENT.

Feb. 25, 1888.

All Weights given are Approximate.

DESCRIPTION.

Rad—Radius of plate.
C—Chord.
L—Length of arm.
W—Width of arm.
T—Thickness.
a—Width of inner water course
b—Width of space between courses.
c—Width of outer water course.

KENNEDY'S PATENT.

No.	*Rad.*	*C*	*L*	*W*	*T*	*a*	*b*	*c*	*Wt.*	*Cypher.*
26	6 ft. 2 in.	4 ft. 8½ in.	27	8½	2¼	3½	2	6	300	Adz
27	6 ft. 9 in.	5 ft. 1 in.	29	8½	2¼	3½	2	6	327	Affix
28	7 ft. 3½ in.	5 ft. 6 in.	31½	8½	2¼	3½	2	6	460	Agate
153	6 ft. 9 in.	5 ft. 2 in.	27	8½	2¼	3½	2	6	327	Babtist
154	7 ft. 3½ in.	5 ft. 6 in.	27	8½	2¼	3½	2	6	347	Bar
274	5 ft. 11 in.	4 ft. 5 in.	25½	8½	2¼	3½	2	6	305	Bifer
275	6 ft. 4½ in.	4 ft. 8½ in.	25½	8½	2¼	3½	2	6	335	Biffin
276	6 ft. 10 in.	5 ft. 1 in.	25½	8½	2¼	3½	2	6	332	Bigamist
277	7 ft. 2 in.	5 ft. 4½ in.	25½	8½	2¼	3½	2	6	352	Bigot
278	7 ft. 7½ in.	5 ft. 8½ in.	25½	8½	2¼	3½	2	6	376	Bijon
279	8 ft. 1 in.	6 ft. 1 in.	25½	8½	2¼	3½	2	6	388	Bilalo
363	5 ft. 11 in.	4 ft. 0 in.	27	8½	2¼	3½	2	6	289	Boracite
400	5 ft. 10½ in.	2 ft. 0 in.	27	8½	2¼	3½	2¼	5¾	140	Brandrith
401	5 ft. 10½ in.	4 ft. 0 in.	27	8½	2¼	3½	2¼	5¾	275	Branlin
402	6 ft. 4 in.	4 ft. 8 in.	27	8½	2¼	3½	2¼	5¾	268	Brash
403	6 ft. 9½ in.	5 ft. 0 in.	27	8½	2¼	3½	2¼	5¾	274	Brassart
404	7 ft. 3 in.	5 ft. 5 in.	27	8½	2¼	3½	2¼	5¾	287	Bray
405	7 ft. 8½ in.	5 ft. 7 in.	27	8½	2¼	3½	2¼	5¾	314	Brayer
420	6 ft. 1 in.	4 ft. 6 in.	30	8½	2¼	3½	2¼	6¼	272	Brevet
421	5 ft. 8¼ in.	5 ft. 0 in.	30	8½	2¼	3½	2¼	6¼	294	Brevier
422	7 ft. 3½ in.	5 ft. 5½ in.	30	8½	2¼	3½	2¼	6¼	316	Breviped
423	7 ft. 10¼ in.	5 ft. 10½ in.	30	8½	2¼	3½	2¼	6¼	334	Brewer
462	5 ft. 10½ in.	2 ft. 6 in.	27	8½	2¼	3½	2½	6	177	Brooch
483	5 ft. 1½ in.	3 ft. 9½ in.	22	8½	2¼	3½	2¼	5¾	230	Bubble
484	5 ft. 7½ in.	4 ft. 2 in.	22	8½	2¼	3½	2¼	5¾	257	Buccan
485	6 ft. 1½ in.	4 ft. 6 in.	25	8½	2¼	3½	2¼	5¾	275	Buccaneer
486	6 ft. 7½ in.	4 ft. 11 in.	28	8½	2¼	3½	2¼	5¾	313	Bucket
721	7 ft. 8½ in.	5 ft. 0 in.	20	8½	2¾	3½	2	6	249	Capsicum

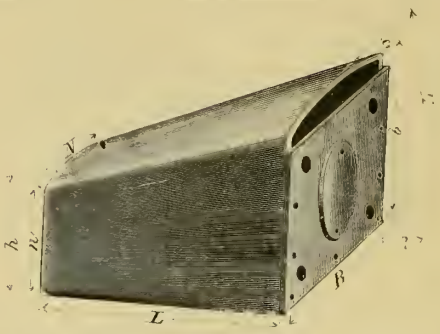
BOSH BOXES.

CLASS B

FRONHEISER'S PATENT.

Sept. 22, 1891.

All Weights given are Approximate.



DESCRIPTION.

n—Short height at nose.
N—Width at nose.
h—Long height at nose.
b—Short " " butt.
B—Width at butt.
H—Long height at butt.
L—Length at base.
l—Batter of bosh wall.

BOSH BOXES, CLASS B.

No.	*n* x *N*	*h*	*b* x *B*	*H*	*L*	*l*	*Wt.*	*Cypher.*
704	10 x 15	16	15 x 20	22	22	3	174	Cantar

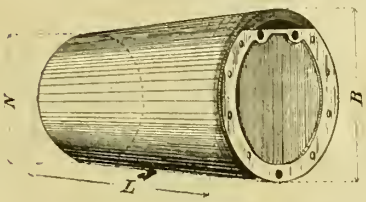
BOSH BOXES.

CLASS C

FRONHEISER'S PATENT.

Sept. 22, 1891.

All Weights given are Approximate.



DESCRIPTION.

N—Diameter at nose.

B—Diameter at butt.

L—Length.

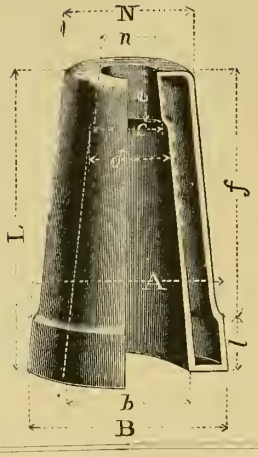
BOSH BOXES, CLASS C.

No.	*N*	*B*	*L*	*Wt.*	*Cypher.*
57	17	22	22	192	Apron
389	14	18	18	123	Bracelet
428	8¾	12	24	88	Bricole
515	12	16½	27	142	Bullion
540	13	16½	21	123	Burgeois

NOTCH COOLERS.

CLASS D

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
c—Small " " nose contraction.
e—Length of " "
d—Large " " " "
b—Inside " " butt.
B—Outside " " "
L—Length over all.
A—Outside diameter at large bearing.
N— " " " nose.
l—Length of outside bearing.
f— " projecting beyond large bearing.

NOTCH COOLERS, CLASS D LONG.

No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
237	4¾	5 1/16	3 1/8	7 1/8	9	13¾	22	13¼	11	4	18	169	Beech
238	5 1/8	6⅜	3½	...	9	13¾	32	12½	10¼	7	25	240	Beetle
362	4⅞	5 9/16	2	6¼	9½	15¼	25	13¾	10	4	21	191	Booth
472	4⅞	5 9/16	2	5¾	9½	15¼	30	13¾	9½	4	26	207	Browse
527	4¾	5 9/16	2	6½	9	13½	24	12¾	10¼	4	20	170	Bundle
553	6	6¼	2½	7⅝	9	13¼	19	12½	10½	3½	15½	144	Burrel
555	6 1/8	6⅝	3	7⅛	9	13¾	22	13¼	11	4	18	173	Burrow
558	6 1/16	6 9/16	3	...	9	13½	24	12¾	10¼	4	20	171	Busby

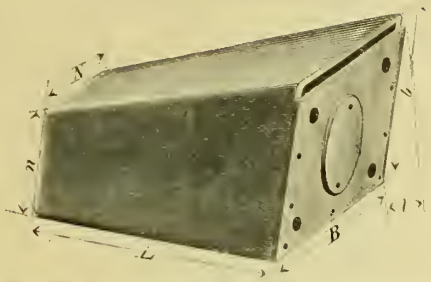
BOSH BOXES

CLASS A

FRONHEISERS'S PATENT.

Sept. 22, 1891.

All Weights given are Approximate.



ESCRIPTION.

n— Height at nose.
N—Width " "
b—Height " butt.
B—Width " "
L—Length " base.
l—Batter of bosh wall.

BOSH BOXES, CLASS A.

No.	*n* x *N*	*b* x *B*	*L*	*l*	*Wt.*	*Cypher.*
38	10 x 15	15 x 20	22	3	168	Alpaca
221	10 x 13	14 1/4 x 16 1/4	18 1/2	2 3/4	137	Bearer
222	14 x 14	17 x 17	16	...	150	Beast
266	11 1/2 x 16 1/4	15 x 20	16	3	135	Beryl
267	12 x 14	14 1/4 x 16 3/8	12	3	103	Beseiger
268	14 1/2 x 14 1/2	17 x 17	13 1/2	...	127	Betuline
281	10 x 16	17 x 21	30	3 1/2	228	Binder
373	9 x 10	11 x 12	10	1 3/4	76	Botch
396	10 1/2 x 10 1/2	15 x 13	18	2 1/4	104	Branch
432	10 x 10	15 x 13	21	2 1/4	109	Brief
509	9 x 10	11 x 12	16	2 1/2	79	Bulchin
690	12 1/4 x 14	14 1/2 x 16 1/4	12	...	82	Canditeer

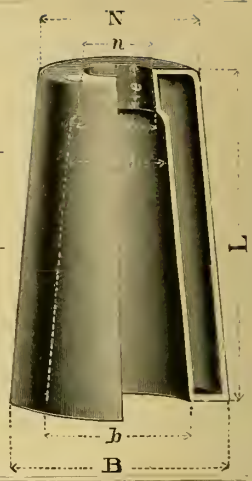
NOTCH COOLERS.

CLASS C.

All Weights given are Approximate.

DESCRIPTION.

n—Inside diameter at nose.
c—Small " " " contraction.
e—Length of nose contraction.
d—Large diameter at nose contraction.
b—Inside diameter at butt.
B—Outside " " "
L—Length over all.
N—Outside diameter at nose.



SHORT AND MEDIUM.

No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*N*	*Wt.*	*Cypher.*
69	4	...	...	...	5 5/8	10 5/8	4 3/8	9	35	Auger
427	4 3/4	5 3/4	3	...	6 3/8	12	6	10	45	Brickbat
475	5	5 7/8	2 1/2	...	7 1/2	12	12	9	74	Brume
479	5 1/8	5 1/16	2 1/2	6 1/4	7 3/4	10 3/4	8 1/4	8 7/8	53	Brusher
500	5 1/4	6 1/8	2 7/8	6 3/8	7 1/2	12	9	9 7/8	60	Buggy
559	4 7/8	5 3/4	2 1/2	6 1/8	7 1/2	12	9	9 7/8	60	Bushel
589	4 3/4	5 7/8	3	...	6 5/16	12 1/4	4	11 1/4	43	Caboose
687	5 1/16	5 13/16	2	6 1/2	7 1/2	11 7/16	7	9 5/8	43	Canderos
694	5 3/4	6 3/8	4 1/4	...	6 5/8	12	6	10	43	Cane

LONG.

No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*N*	*Wt.*	*Cypher.*
194	6 7/16	7 1/8	3	8	12	17	30	12	295	Bat
197	4 7/8	5 5/8	2 1/4	8	11 1/2	16 1/2	27	12	270	Batlet
198	5 9/16	6 1/8	2 1/2	8	11	16	24	12	230	Batman
254	5 1/4	6 5/16	3	7 1/2	10 3/4	15 3/8	25	10 1/2	192	Beucher
290	4 7/8	5 5/8	2 1/4	8	11	16	24	12	233	Bison
309	4 7/8	5 5/8	2 1/4	8	12	17	30	12	308	Blister
367	4 13/16	5 1/2	2 3/4	7 1/2	10 3/4	15 3/8	25	10 1/2	200	Borough
464	5 5/16	6 3/8	3	8	12	17	30	12	287	Brooklet
477	6 7/16	7 1/8	3	8	11	16	24	12	234	Brunion
505	6 5/8	7 1/8	3	8	11	16	24	12	235	Bulb
546	4 7/8	5 7/8	2 3/4	9 7/8	14	19	20	13	450	Burin
592	5 5/16	6 3/8	3	8	11	16	24	12	235	Cacoa
702	5 9/16	6 1/8	2 1/2	8	11 1/2	16 1/2	27	12	249	Canonist

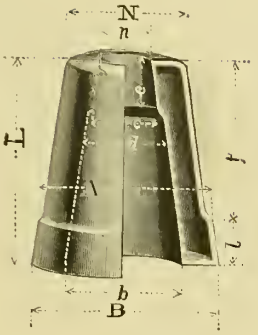
NOTCH COOLERS.

CLASS D.

All Weights given are Approximate.

DESCRIPTION.

n—Inside diameter at nose.
c—Small " " " contraction.
e—Length of nose contraction.
d—Large diameter at nose contraction.
b—Inside diameter at butt.
B—Outside " " "
L—Length over all.
A—Outside diameter at large bearing.
N—Outside diameter at nose.
l—Length of outside bearing.
f— " projecting beyond large bearing.



SHORT.

No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
249	4 1/2	5 3/4	3 1/2	...	6 7/8	11 3/8	9	11	9 1/4	3	6	60	Bell
294	5 5/16	6	2	6 1/2	7 1/2	11	7	10	9	3	4	45	Blackball
323	4 13/16	5 9/16	2 1/2	5 7/8	6 1/4	11 1/8	6	10 9/16	10	3 1/8	2 7/8	44	Bluster
347	5	5 3/4	2	6 1/2	7 1/2	11	7	10	9	3	4	46	Boltonite
379	5 3/8	5 3/4	1	6	9	14 1/4	11	13	10 1/4	4	7	93	Boundary
384	6 1/8	6 5/8	3 1/8	...	7	11	9	10	9 1/2	3	6	52	Bowlder
459	5 1/4	6 3/8	3	6 5/8	7	11	9	10	9 1/2	3	6	57	Brond
613	6 1/8	7 1/4	3	...	8 1/4	12 1/8	9	11 1/8	10 1/4	3	6	63	Caird

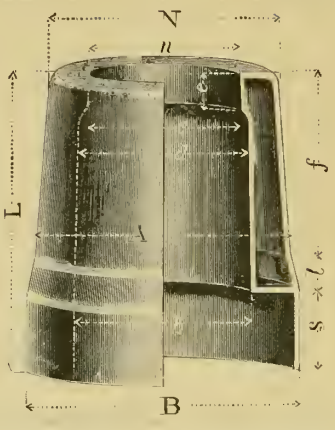
MEDIUM.

No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
241	4 7/8	6	3	7 5/8	9	13 1/4	15	12 1/2	11	3 1/2	11 1/2	110	Beguiler
460	6 1/16	6 9/16	3	6 5/8	6 3/4	11	12	10 1/16	9 3/4	3	9	74	Brontern
551	5 1/8	6 1/8	3	...	8 1/2	14 1/2	15	12 1/2	9 7/8	6	9	120	Burnisher
640	4 3/4	...	...	...	10	15 3/4	15	14 3/4	10 1/2	5	10	136	Calipash

COOLERS.

CLASS F

All Weights given are Approximate.



DESCRIPTION.

a—Inside diameter at nose.
c—Small " " " contraction.
e—Length of " "
d—Large " " " "
b—Inside " " butt.
B—Outside " " "
L—Length over all.
A—Outside diameter at large bearing.
N— " " " nose.
O— " " of sleeve.
S—Length of sleeve.
l— " " outside bearing.
f— " projecting beyond large bearing.

FOR SMALL TUYERES.

No.	*a*	*c*	*e*	*d*	*b*	*B*	*L*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt.*	*Cypher.*
79	10 1/4	11 1/8	2 1/2	12 1/2	14 1/4	20	20	19 1/8	17	20	6 1/2	2 1/2	11	230	Baal

FOR MEDIUM TUYERES.

No.	*a*	*c*	*e*	*d*	*b*	*B*	*L*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt*	*Cypher.*
53	11 7/16	12 1/8	2 1/2	12 1/8	14 1/4	20	22 1/2	19 1/2	16 1/2	20	6 1/2	2 1/2	13 1/2	290	Ape
215	11 5/8	12 1/2	3 1/8	13 1/8	17 1/2	23	22	22 3/4	16 1/2	23	2	3	17	326	Beacon

FOR LARGE TUYERES.

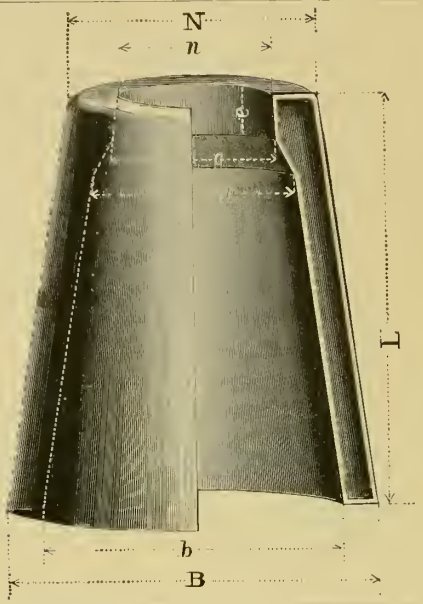
No.	*a*	*c*	*e*	*d*	*b*	*B*	*L*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt.*	*Cypher.*

COOLERS

CLASS A

LONG.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
c—Small " " " contraction.
e—Length of nose contraction.
d—Large diameter at nose contraction.
b—Inside diameter at butt.
B—Outside " " "
L—Length over all.
N—Outside diameter at nose.

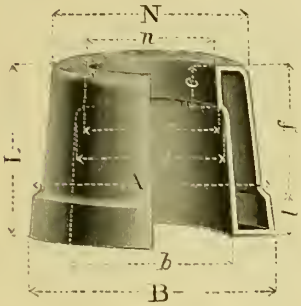
FOR LARGE TUYERES.

No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*N*	*Wt.*	*Cypher*
55	12½	14 9/16	6	15¼	19	23½	22	18½	340	Apple
56	13	13½	3	15½	22 3/8	27¼	30	19	530	Apricot
164	12 9/16	13 5/16	3	15½	22 3/8	27¼	30	19	531	Barley
284	12 5/16	13 5/16	2¾	15½	21½	26¼	26½	19	470	Biped
291	12 9/16	13 5/16	3	15½	21½	26¼	26½	19	490	Bistort
315	12 9/16	13 5/16	3	15½	20¾	25¾	24	19	436	Bloomer
366	12¼	13	3	15¼	19	23½	22	18½	371	Boreas
380	12 3/16	13 7/16	3	13 5/8	19	24 5/8	26	18	420	Bounty
395	12	13	3 3/8	15½	21½	26¼	26½	19	495	Bramble
426	12	13	3 3/8	15½	22 3/8	27¼	30	19	553	Brick
473	12	13	3½	13¼	19	23½	30	16¾	445	Brucina
502	12¾	14 1/8	4½	15½	21½	26¼	26½	19	493	Bugloss
591	12	13	3½	13 5/8	19 7/8	24 5/8	32	17¼	538	Caburn
610	15 7/8	17 3/8	6	18	25	34	30	24¾	755	Cahier
612	12 9/16	13 5/16	3	15¾	24	30	26½	20¼	523	Caique

COOLERS.

CLASS B

All Weights given are Approximate



DESCRIPTION.

n—Inside diameter at nose.
c—Small " " " contraction.
e—Length of " " "
d—Large " " "
b—Inside " " butt.
B—Outside " " "
L—Length over all.
A—Outside diameter at large bearing.
N— " " " nose.
l—Length of outside bearing.
f— " projecting beyond large bearing.

FOR SMALL TUYERES.

No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
258	$9\frac{11}{16}$	$10\frac{1}{2}$	3	11	$12\frac{3}{4}$	18	$12\frac{1}{2}$	17	$14\frac{1}{2}$	3	$9\frac{1}{2}$	150	Bengal
399	$10\frac{3}{8}$	$11\frac{5}{16}$	$2\frac{3}{4}$	$11\frac{3}{4}$	$12\frac{3}{8}$	18	15	17	16	3	12	194	Brander

FOR MEDIUM TUYERES.

No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
310	$11\frac{7}{16}$	$12\frac{7}{16}$	3	$13\frac{5}{8}$	$16\frac{1}{8}$	$21\frac{1}{4}$	$17\frac{3}{4}$	$19\frac{3}{4}$	$16\frac{3}{4}$	3	$14\frac{3}{4}$	245	Bloater
476	$11\frac{1}{2}$	$11\frac{3}{4}$	3	...	$12\frac{3}{8}$	18	15	17	16	3	12	195	Brunette
511	$11\frac{1}{2}$	$12\frac{1}{8}$	3	...	$12\frac{1}{2}$	18	15	17	16	3	12	195	Bullary
530	$11\frac{1}{4}$	12	3	$12\frac{1}{4}$	$13\frac{3}{8}$	$19\frac{1}{2}$	18	$17\frac{7}{8}$	16	3	15	215	Buntline

FOR LARGE TUYERES.

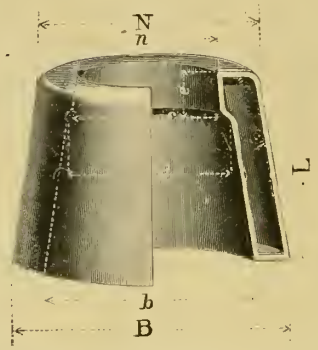
No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
383	$12\frac{3}{8}$	$13\frac{1}{4}$	$3\frac{1}{4}$	$14\frac{1}{4}$	$17\frac{1}{2}$	$23\frac{1}{4}$	$17\frac{3}{4}$	$21\frac{1}{2}$	$17\frac{5}{8}$	$3\frac{1}{2}$	$14\frac{1}{4}$	272	Bovate
436	$12\frac{13}{16}$	$13\frac{9}{16}$	$3\frac{1}{4}$	...	$15\frac{7}{8}$	$21\frac{1}{4}$	$15\frac{1}{4}$	$19\frac{7}{8}$	17	3	$12\frac{1}{4}$	224	Brill

TUYERES.

CLASS A

SHORT.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
e—Small " " " contraction.
e—Length of " "
d—Large " " " "
b—Inside " " butt.
B—Outside " " "
L—Length over all.
N—Outside diameter at nose.

FOR SMALL TUYERES.

No.	*n*	*e*	*e*	*d*	*b*	*B*	*L*	*N*	*Wt.*	*Cypher.*
83	10½	12	3	12⅜	15¼	20	14	16	206	Bablah
112	9⅞	10¾	3	12⅜	15¼	20	14	16	205	Baker
173	10½	12	3	15½	21	26	20	19	385	Barrow
240	10 9/16	11 1/16	3	..	15¼	20	19	14⅝	250	Beginner
406	10½	11¼	3	12⅜	15¼	20	14	16	208	Brasier
461	10⅜	11¼	2½	13½	16¼	20¼	17	17	225	Bronzist
579	9 5/16	9⅝	2½	10¼	12¾	17½	20	14½	237	Caballine

FOR MEDIUM TUYERES.

No.	*n*	*e*	*e*	*d*	*b*	*B*	*L*	*N*	*Wt.*	*Cypher.*
348	11 3/16	11 3/16	3	15¼	18⅜	23	20	18½	350	Bomb
375	11½	12⅛	3	..	12½	18	15	16	178	Bottom
699	11 5/16	12⅛	3	15¼	18⅜	23	20	18½	351	Cannon

FOR LARGE TUYERES.

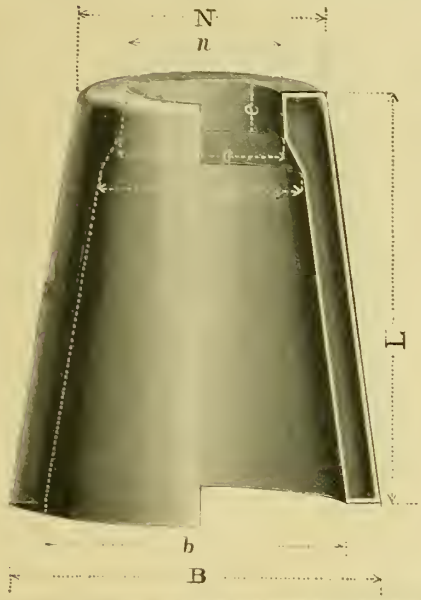
No.	*n*	*e*	*e*	*d*	*b*	*B*	*L*	*N*	*Wt.*	*Cypher.*
84	13 7/16	15	3	15½	21	26	20	19	380	Baboon
239	12	12½	2¾	13½	16¼	20¼	17	17	230	Beggar
351	12 9/16	13 9/16	3	14¾	18	22⅝	18	18½	304	Bonasus
470	13¼	14¾	3	15	18	22⅝	18	18½	287	Brougham
482	12	13	3½	13⅝	17½	22	21	17¼	338	Bryony
685	12	13⅛	3⅞	13⅞	16¼	20¼	17	17	238	Cancer
719	12 5/16	13 7/16	2¾	14¾	18	22⅝	18	18½	295	Capote

COOLERS

CLASS A.

LONG.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
c—Small " " " contraction.
e—Length of nose contraction.
d—Large diameter at nose contraction.
b—Inside diameter at butt.
B—Outside " " "
L—Length over all.
N—Outside diameter at nose.

FOR SMALL TUYERES.

No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*N*	*Wt.*	*Cypher.*
52	10 5/8	11 1/4	2 3/4	12 3/4	20	24 1/2	26	16	410	Anvil
145	10 1/2	11 1/16	3	13 1/8	18	22 1/4	22	16 1/2	350	Bank
158	9	10 5/8	4 1/2	15 1/4	19	23 1/2	22	18 1/2	390	Barbecue
193	10 1/4	11 1/4	3	15 1/2	21 1/2	26 1/4	26 1/2	19	496	Bastion
322	10 5/8	11 3/8	3	11 7/8	19	23 1/2	35 1/2	16	549	Blush
354	10 1/8	11	2 7/8	12 3/4	20	24 1/2	26	16	418	Bonfire
393	10 3/8	10 15/16	3	13 1/8	18	22 1/4	22	16 1/2	331	Braid
431	9 13/16	10 1/4	3 1/2	13 1/8	17 1/2	21 3/4	22	16	316	Bridoom
463	10 13/16	12 1/8	2 1/4	12 3/4	20	24 1/2	26	16	403	Brook
512	10 1/8	10 3/4	2 3/4	12 3/4	20	24 1/2	26	16	433	Bullet
529	10 3/4	11 7/8	3 3/8	15 1/2	21 1/2	26 1/4	26 1/2	19	491	Bunker
621	10 1/2	12	3	15 1/4	19	23 1/2	22	18 1/2	380	Calamine
662	10	11	3	11 5/8	13 3/8	19	27	15	348	Calyptra
706	10 7/8	11 13/16	2 7/8	15 1/4	19	23 1/2	22	18 1/2	383	Canticle

FOR MEDIUM TUYERES.

No.	*n*	*c*	*e*	*d*	*b*	*B*	*L*	*N*	*Wt*	*Cypher.*
54	11 1/8	12 1/8	3	13 1/8	18	22 1/4	22	16 1/2	340	Apostate
65	11 7/8	12 1/2	3	15 1/2	22 3/8	27 1/4	30	19	535	Asp
102	11 9/16	12 5/16	3	15 1/2	21 1/2	26 1/4	26 1/2	19	490	Bagnet
125	11 5/16	12 1/8	3	15 1/2	21 1/2	26 1/4	26 1/2	19	500	Balsam
191	11	12	6	15 1/4	19	23 1/2	22	18 1/2	350	Bassoon
205	11 5/16	12 1/8	3	12 3/4	20	24 1/2	26	16	420	Baulk
253	11 9/16	12 5/16	3	15 1/2	22 3/8	27 1/4	30	19	515	Bench
273	11 7/8	12 1/2	3	15 1/2	21 1/2	26 1/4	26 1/2	19	490	Bidder
330	11 5/8	12 3/8	3 1/4	12 3/4	20	24 1/2	26	16	415	Boatswain
365	11 5/16	12 1/16	3	13 1/8	18	22 1/4	22	16 1/2	343	Border
394	11 5/16	12 1/8	3	15 1/2	22 3/8	27 1/4	30	19	525	Brake
397	11 1/16	11 7/8	3 3/8	15 1/2	21 1/2	26 1/4	26 1/2	19	520	Brancher
419	11 1/16	12 7/8	3 3/8	15	19	23 1/2	22	18 1/2	361	Bretzel
435	11 7/8	13	3 3/8	15 1/2	21 1/2	26 1/4	26 1/2	19	459	Brigantine
443	11 3/16	11 1/16	3	13 1/8	18	22 1/4	22	16 1/2	340	Bristle
448	11 3/8	12 1/2	3 1/8	13 1/8	18	22 1/4	22	16 1/2	343	Broacher
467	11 3/8	13	3 1/2	15 1/2	21 1/2	26 1/4	26 1/2	19	463	Brookweed
488	11 3/16	12 3/8	3 1/8	12 3/4	19 1/2	24	24	16	339	Buckler
518	11 3/8	12 1/8	3	15 1/4	19	23 1/2	22	18 1/2	380	Bultow
556	11 3/16	12	3 1/4	15 1/4	19	23 1/2	22	18 1/2	380	Bursar
568	11 9/16	12 9/16	3 1/2	...	17 1/2	21 3/4	24	16	360	Buttock
681	11 9/16	12 1/2	3 1/2	13 1/4	19	23 1/2	30	16 1/2	441	Canakin

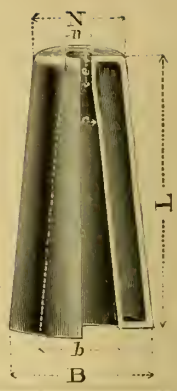
CINDER NOTCHES

CLASS C

All Weights given are Approximate.

DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
N— " " " nose.
C—Small diameter at nose contraction.
e—Length of " "



SHORT.

No.	n	b	L	B	N	C	e	Wt.	Cypher.
48	3	3½	7	7	6	2½	2	25	Annual
50	1½	2½	4¼	5¾	4¼	1½	2	10	Antidote
51	1¼	2½	4¼	5¾	4¼	1¼	2	10	Antique
70	1¾	2½	4¼	5¾	4¼	1¾	2	10	Aunt
97	2	2½	4¼	5¾	4¼	2	2	10	Baftas
167	2¼	2½	4¼	5¾	4¼	2	2	10	Baron
192	2	3	4¼	6	5	2	2	12	Bastile
489	3	3¾	5	6¼	5½	2½	1½	13	Buckra
674	2¼	2½	4¼	5¾	4¾	1¼	2	12	Camlet
692	2	2¼	4¼	5¾	4¾	1	2	12	Candock

MEDIUM AND LONG.

No.	n	b	L	B	N	C	e	Wt.	Cypher.
232	2	6	15½	10⅛	8	2	2	80	Bedlem
247	2	6½	20	10¾	8	2	2	102	Belief
261	2½	7½	24	12	8¾	2½	3	145	Bergamot
381	3	4	10	8⅞	6¾	3	3	34	Bouquet
468	2½	6½	20	10¾	8	2½	2	100	Brose
673	3	7½	24	12	8¾	3	3	137	Camisade

CINDER NOTCHES

CLASS D

All Weights given are Approximate.

DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
N— " " " nose.
C—Small " " nose contraction.
e—Length of nose contraction.
l— " " cooler bearing.
f— " projecting beyond cooler.

No.	n	b	L	B	A	N	e	e	l	f	Wt.	Cypher.
92	2¼	2½	6	6¼	5⅛	4½	1¾	1¾	3	3	18	Bacon
293	2	3	5	6	5¼	4½	2	2	2	3	12	Bittern
302	1½	2½	4¼	5 9/16	3 13/16	3⅝	1½	1¾	2¾	1½	10	Blea
528	2	2½	5	6	5¼	4½	2	2	2	3	13	Bungalow
575	2	3	5	6¼	5½	4½	2	2	2¼	2¾	14	Byzant
582	2⅜	4	5	7	6¼	5⅝	2¾	2¼	2	3	18	Cabbage
594	1¾	3	5	6	5¼	4½	2	2	2	3	12	Cache
718	2	3⅝	7	6 11/16	4 9/16	4½	2⅛	2⅜	6	1	18	Caponet

CINDER NOTCHES

CLASS A

All Weights given are Approximate.

DESCRIPTION.

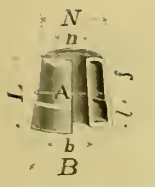
n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
N— " " " nose.

SHORT.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
150	1 1/2	2 1/2	4 1/4	5 3/4	4 1/4	10	Banquet
190	1 1/2	3	9	7	5 3/8	23	Basset
211	2 1/2	3 1/2	6	6 1/2	5 1/2	15	Bay
327	2	3 1/2	7	7	6	25	Boaster
331	3	3 1/2	7	7	6	25	Bobbin
338	3	3 1/4	5	6 1/4	5 3/4	15	Bockey
342	1 1/2	3 1/2	7	7	6	26	Boiarin
371	2	3 1/4	4 1/2	6 1/4	5 7/8	15	Botanist
410	1 1/4	3 1/2	7	7	6	24	Bream
417	2	3 1/2	6	6 1/2	5 1/2	18	Breton
478	2 1/2	3	4	7	6 1/4	15	Brush
480	2 1/2	3	5 1/2	6	5	14	Brute
534	2 1/2	3 1/2	7	7	6	27	Burden
653	1 3/4	3 1/2	8	6 7/8	6 1/4	28	Caltrap
693	3	3 1/4	5	6 7/16	5 3/4	16	Candroy
725	2	3 1/2	8	6 7/8	6 1/4	28	Captive

MEDIUM AND LONG.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
236	2 1/2	4	10	7 7/8	6 3/8	40	Bee
319	1 1/4	6	16	11	8	82	Blower
352	3	5	10	9 1/8	7 1/4	56	Bonbon



CINDER NOTCHES

CLASS B

All Weights given are Approximate.

DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
N— " " " nose.
l—Length of cooler bearing.
f— " projecting beyond cooler.

SHORT.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	Wt.	Cypher.
324	2	2 9/16	4	5 9/16	4 7/8	4 1/2	2	2	10	Board
336	3	3 3/4	6	7 1/8	7	6 1/2	3 1/2	2 1/2	23	Bocasine
387	2	3	5	5 3/4	5	4 3/8	2 1/2	2 1/2	11	Boyar
516	3	3 3/4	6	7 3/4	7	6 1/2	3 1/2	2 1/2	24	Bulrush
569	2	3 1/2	5	6	5 5/16	4 1/2	2	3	12	Buttress
574	2 1/2	3 3/4	6	7 3/4	7	6 1/2	3 1/2	2 1/2	25	Byard
586	1 1/2	3	5	7	6 1/4	5 5/8	2	3	16	Cabirean
599	1 1/2	3	5	6	5 1/4	4 1/2	2	3	12	Cactus
614	2 1/2	3 1/2	6	7 1/8	6	5 1/2	3	3	21	Caisson
623	1 1/2	3	5	7	6 1/2	5 5/8	2	3	16	Calamus
643	2	4	5	7	6 1/2	5 5/8	2	3	18	Caliphate
730	2	3 3/4	6	7 1/8	7	6 1/2	3 1/2	2 1/2	23	Carafe

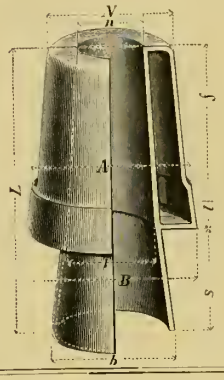
MEDIUM.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	Wt.	Cypher.

TUYERES.

CLASS I

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
I—Inside " " cooler bearing.
A—Outside " " " "
N— " " " nose.
S—Length of sleeve.
l— " " cooler bearing.
f— " beyond cooler bearing.

4½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*I*	*A*	*N*	*S*	*l*	*f*	*Wt.*	*Cypher.*
250	4½	7	16½	10	5¼	9⅛	8¾	6	3	7½	69	Belone
374	4½	9¼	18	12	7½	11¼	9¼	6	3	9	73	Bottle

5 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*I*	*A*	*N*	*S*	*l*	*f*	*Wt.*	*Cypher.*
243	5	9	20½	12⅜	6½	11⅜	9	7½	3½	9½	94	Belemnite
425	5	9¼	18	12	8½	11¼	9¼	6	3	9	75	Bribe

5½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*I*	*A*	*N*	*S*	*l*	*f*	*Wt.*	*Cypher.*
714	5½	9 3/16	12⅛	13¾	7	12½	9½	1½	4⅝	6	92	Capital

6 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*I*	*A*	*N*	*S*	*l*	*f*	*Wt.*	*Cypher.*
382	6	7¼	28	11½	7	...	10⅛	6	...	22	100	Bourse
651	6	9	23½	13¼	7½	12½	11¼	11½	3	9	123	Calomel

6½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*I*	*A*	*N*	*S*	*l*	*f*	*Wt.*	*Cypher.*

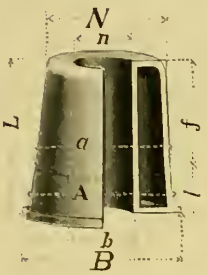
7 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*I*	*A*	*N*	*S*	*l*	*f*	*Wt.*	*Cypher.*
318	7	9⅛	12¾	13¾	8	12⅜	11⅜	2	3¾	7	93	Blouse

TUYERES.

CLASS J

All Weights given are Approximate.



DESCRIPTION.

a—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A— " " inside of cooler.
a— " " at cooler bearing.
N— " " " nose.
R—Length of collar.
l— " " cooler bearing.
f— " beyond cooler bearing.

4 INCH TUYERES

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*R*	*l*	*f*	*Wt.*	*Cypher.*
585	4	5 1/2	7	10	9 1/2	9 3/16	8 1/2	1/2	2 1/2	4	40	Cabinet

4 1/2 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*R*	*l*	*f*	*Wt.*	*Cypher.*
539	4 1/2	5 1/4	11	10	9 1/2	9 3/8	8 1/4	1/2	2 1/2	8	56	Burgee
544	4 1/2	5 3/4	12	10 5/8	9 9/16	...	8	1	...	11	74	Burgrass

5 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*R*	*l*	*f*	*Wt.*	*Cypher.*
503	5	5 1/2	7	10	9 1/2	9 3/16	8 1/2	1/2	2 1/2	4	40	Buhl
520	5	6	12	11 13/16	10 3/4	...	9 1/4	5/8	...	11 3/8	77	Bumble
545	5	6	10	11 13/16	10 3/4	...	9 1/2	5/8	...	9 3/8	70	Burgrave
657	5	6	12	11 3/4	10 3/4	...	9 1/4	1/2	...	11 1/2	78	Calvary

5 1/2 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*R*	*l*	*f*	*Wt.*	*Cypher.*

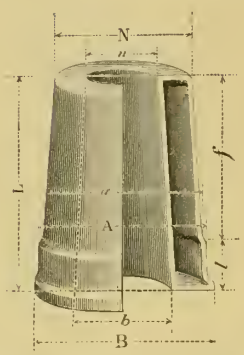
6 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*R*	*l*	*f*	*Wt.*	*Cypher.*

TUYERES.

CLASS G.

All Weights given are Approximate.



DESCRIPTION.

a—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
a—Small " beyond cooler bearing
N—Outside " at nose.
l—Length of cooler bearing.
f— " beyond cooler bearing.

5½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*l*	*f*	*Wt.*	*Cypher.*
24	5½	8	13	14¾	13⅛	12½	10⅜	3	10	105	Admiral
77	5½	7¼	15½	12⅞	12	11¾	10½	3½	12	115	Axle
326	5½	8	11½	13 5/16	12¼	12	10⅜	3	8½	96	Boast
328	5½	8	13	13 5/16	12¼	12	10⅜	3	10	96	Boaston
682	5½	6⅝	13	12⅜	11⅜	11 3/16	10⅛	3½	9½	87	Canal

6 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*l*	*f*	*Wt.*	*Cypher.*
23	6	8	13	14¾	13⅛	12½	10⅜	3	10	107	Adept
78	6	7¼	15½	12⅞	12	11¾	10½	3½	12	115	Aztec
259	6	8	13	13 5/16	12¼	12	10⅜	3	10	97	Bennet
361	6	6⅝	13	12⅜	11⅜	11 3/16	10⅛	3½	9½	83	Bootel
385	6	7½	10	12⅜	11⅝	11⅜	10⅛	3½	6½	76	Bowline
440	6	6	12	13¼	12½	12⅛	11	3¼	8¾	100	Brindle
566	6	7	15½	13¼	12½	12⅛	11	3¼	12¼	125	Butternut
567	6	7	12	13¼	12½	12⅜	11	3¼	8¾	95	Buttery

6½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*l*	*f*	*Wt.*	*Cypher.*
122	6½	8	13	14¾	13⅛	12½	11½	3	10	110	Balloon
337	6½	6⅞	11½	12⅞	12	11¾	10½	3½	8	90	Bochelet

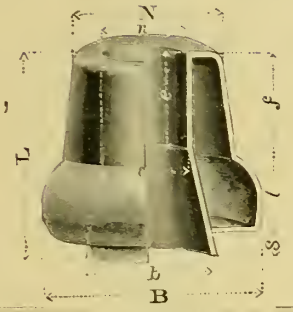
7 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*l*	*f*	*Wt.*	*Cypher.*
22	7	8	13	14¾	13⅛	12½	11½	3	10	110	Adder
316	7	8	15½	13¼	12½	12⅛	11	3¼	12¼	130	Blossom
372	7	7	15½	13¼	12½	12⅛	11	3¼	12¼	136	Botargo
407	7	8	11¾	13¼	12½	12⅛	11⅛	3¼	8½	97	Breach
433	7	7	12	13¼	12½	12⅛	11	3¼	8¾	101	Brigade

TUYERES AND NOTCH,

CLASS H

All Weights given are Approximate.



DESCRIPTION.

a—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
N " " " nose.
S—Length of sleeve.
l—Length of cooler bearing.
f— " beyond cooler bearing.
e— " of nose contraction.
c—Small diameter at nose contraction.

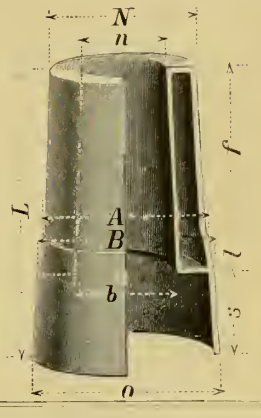
No.	*a*	*b*	*L*	*B*	*A*	*N*	*S*	*l*	*f*	*e*	*c*	*Wt.*	*Cypher.*
7	7	9 1/2	14	15 1/2	13	11 1/2	1 3/4	5 3/4	6 1/2	7	7	121	Abnet
8	6	9 1/2	14	15 1/2	13	11 1/2	1 3/4	5 3/4	6 1/2	6 1/2	6	116	Abode
9	1 7/8	3	5 1/2	8	5 1/2	4 7/8	...	3 5/8	1 7/8	2 1/4	1 7/8	22	Aboma
14	5	9 1/2	15 1/4	15 1/2	11 7/8	10	1 3/4	6 1/2	7	6	5	115	Average

TUYERES.

CLASS F

LONG.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
N— " " " nose.
O— " " " of sleeve.
S—Length of sleeve.
l— " " cooler bearing.
f— " beyond cooler bearing.

6 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt.*	*Cypher.*
44	6	7	20	12 1/16	11 7/16	10 1/4	12 3/8	8	2 1/2	9 1/2	100	Angel
47	6	8 1/2	16	13 1/4	...	10 1/2	14 1/2	4	...	12	110	Ankle
214	6	6 1/2	18	11 5/8	10 3/4	10	12	6	2 1/2	9 1/2	105	Beach
216	6	7	19	12 1/16	11 7/16	10 1/4	12 3/8	8	2 1/2	8 1/2	105	Bead
242	6	7 1/2	17	12 5/8	11 3/4	11	13	6	2 1/2	8 1/2	106	Beholder
244	6	7	16	12 1/16	11 7/16	10 5/8	12 3/8	8	2 1/2	5 1/2	92	Belfry
265	6	9	22	14	...	10 1/2	14 3/4	4	...	18	146	Berry
280	6	7	18	12	11 1/4	10 1/4	13	6	2 1/2	9 1/2	107	Billot

6½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt.*	*Cypher.*
45	6 1/2	8	25	13 1/8	12 1/4	11 1/4	13 3/8	10	2 3/4	12 1/4	138	Angler
203	6 1/2	7 1/2	21	12 5/8	11 3/4	10 3/4	13	6	2 1/2	12 1/2	125	Baubee
223	6 1/2	7 1/2	17	12 5/8	11 3/4	11	13	6	2 1/2	8 1/2	106	Beater

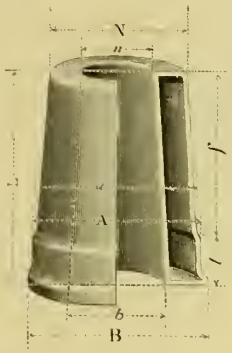
7 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt.*	*Cypher.*
46	7	8	25	13 1/8	12 1/4	11 1/4	13 3/8	10	2 3/4	12 1/4	142	Animal
204	7	7 7/8	21	12 5/8	11 3/4	10 3/4	13	6	2 1/2	12 1/2	127	Baudkin
434	7	7 1/2	17	12 5/8	11 3/4	11	13	6	2 1/2	8 1/2	110	Brigand

TUYERES.

CLASS G

All Weights given are Approximate.



DESCRIPTION.

a—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
a—Small " beyond cooler bearing.
N—Outside " at nose.
l—Length of cooler bearing.
f— " beyond cooler bearing.

4 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*l*	*f*	*Wt.*	*Cypher.*
136	4	6 1/2	13	12 3/8	11 3/8	11 1/8	9	3 1/2	9 1/2	79	Bandog
210	4	8	13	14 3/4	13 1/8	12 1/2	8 1/2	3	10	93	Bawler
295	4	5 1/2	10	10	9	8 3/4	8	3	7	49	Blackbird
369	4	7 1/4	15 1/2	12 7/8	12	11 3/4	10 1/2	3 1/2	12	112	Boscage
698	4	6 1/2	12	12 1/16	10 7/16	10 1/4	9 1/4	3	9	71	Cannibal

4½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*l*	*f*	*Wt.*	*Cypher.*
116	4 1/2	6 1/2	13	12 3/8	11 3/8	11 1/8	9	3 1/2	9 1/2	78	Baleen
124	4 1/2	6 1/2	12	12 1/16	10 7/16	10 1/4	9 1/4	3	9	65	Balm
256	4 1/2	5 1/2	10	10	9	8 3/4	8	3	7	48	Benedict
590	4 1/2	6	9	11 3/4	11	10 5/8	9 5/8	3	6	65	Cabriolet
649	4 1/2	7 1/4	15 1/2	12 7/8	12	11 3/4	10 1/2	3 1/2	12	78	Callus
665	4 1/2	7 1/4	9 3/8	12 7/8	11 15/16	11 3/4	10	3 3/8	6	77	Camber
686	4 1/2	6	12	11 3/4	11	10 5/8	9 1/8	3	9	79	Cancerite

5 INCH TUYERES.

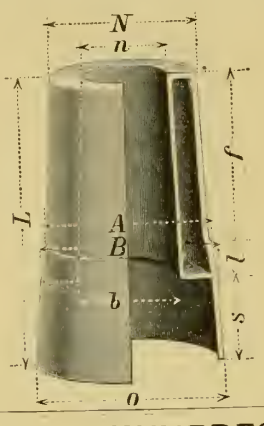
No.	*a*	*b*	*L*	*B*	*A*	*a*	*N*	*l*	*f*	*Wt.*	*Cypher.*
100	5	6 1/2	13	12 3/8	11 3/8	11 1/8	9	3 1/2	9 1/2	80	Baggage
107	5	6 1/2	12	12 1/16	10 7/16	10 1/4	9 1/4	3	9	65	Bailer
174	5	7 1/4	15 1/2	12 7/8	12	11 3/4	10 1/2	3 1/2	12	115	Barse
219	5	5 1/4	10 1/2	10	9 1/8	8 7/8	8 3/4	3	7 1/2	56	Beamlet
344	5	7	13	12 3/8	11 3/8	11 1/4	9 1/4	3 1/2	9 1/2	89	Bolis
370	5	6 1/4	9	11 3/4	11	10 5/8	9 5/8	3	6	66	Bosset
598	5	7	16	12 3/8	11 3/8	11 3/16	9 1/4	3 1/2	12 1/2	99	Cacodyle
722	5	6 1/4	12	11 3/4	11	10 5/8	9 1/8	3	9	81	Capstan

TUYERES.

CLASS F

LONG.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
N— " " " nose.
O— " " " of sleeve.
S—Length of sleeve.
l— " " cooler bearing.
f— " beyond cooler bearing.

3 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt.*	*Cypher.*
151	3	5	20	10 1/8	9 1/4	8	10 3/8	8	2 1/2	9 1/2	87	Banshee
178	3	6	20	11 1/8	19 1/4	9 1/4	11 1/4	8	2 1/2	9 1/2	112	Bartram

3½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt.*	*Cypher.*
118	3 1/2	6	20	11 1/8	10 1/4	9 1/4	11 1/4	8	2 1/2	9 1/2	100	Ballad
187	3 1/2	5	20	10 1/8	9 1/4	8	10 3/8	8	2 1/2	9 1/2	88	Basket

4 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt.*	*Cypher.*
40	4	5	20	10 1/8	9 1/4	8	10 3/8	8	2 1/2	9 1/2	89	Ament
113	4	6	20	11 1/8	10 1/4	9 1/4	11 1/4	8	2 1/2	9 1/2	104	Balance
172	4	7	20	12 1/16	11 7/16	10 1/4	12 3/8	8	2 1/2	9 1/2	105	Barrier

4½ INCH TUYERES.

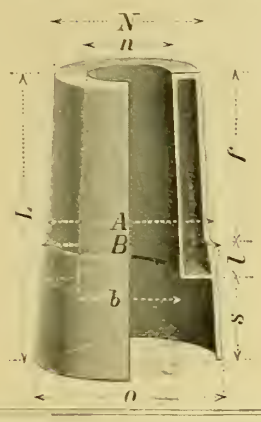
No.	*n*	*b*	*L*	*B*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt*	*Cypher.*
44	4 1/2	6	20	11 1/8	10 1/4	9 1/4	11 1/4	8	2 1/2	9 1/2	101	Anchor
155	4 1/2	7	20	12 1/16	11 7/16	10 1/4	12 3/8	8	2 1/2	9 1/2	105	Barb

TUYERES.

CLASS F

LONG.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
N— " " " nose.
O— " " " of sleeve.
S—Length of sleeve.
l— " " cooler bearing.
f— " beyond cooler bearing.

5 INCH TUYERES

No.	*n*	*b*	*L*	*B*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt.*	*Cypher.*
42	5	6	20	11 1/8	10 1/4	9 1/4	11 1/4	8	2 1/2	9 1/2	100	Ancient
148	5	7	20	12 1/16	11 7/16	10 1/4	12 3/8	8	2 1/2	9 1/2	111	Banner
217	5	7	19	12 1/16	11 7/16	10 1/4	12 3/8	8	2 1/2	8 1/2	103	Beadle
227	5	6	21	12 1/8	10 3/4	10	12 3/8	7 1/2	4	9 1/2	124	Beaver
260	5	6	15	11 1/8	10 1/4	9 5/8	11 1/4	8	2 1/2	4 1/2	84	Benzine
298	5	7	18	12 1/8	11 1/4	10 1/4	13	6	2 1/2	9 1/2	108	Blade
638	5	7	22	12 1/16	11 7/16	10	12 3/8	8	2 1/2	11 1/2	119	Caliduct

5½ INCH TUYERES.

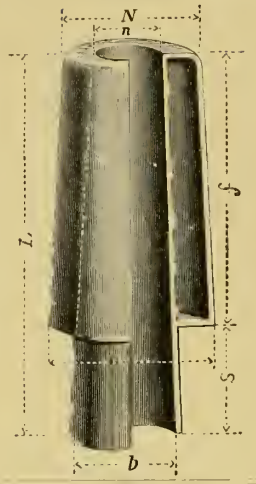
No.	*n*	*b*	*L*	*B*	*A*	*N*	*O*	*S*	*l*	*f*	*Wt.*	*Cypher.*
43	5 1/2	7	20	12 1/16	11 7/16	10 1/4	12 3/8	8	2 1/2	9 1/2	109	Andiron
213	5 1/2	6 1/2	18	11 5/8	10 3/4	10	12	6	2 1/2	9 1/2	104	Bazar
471	5 1/2	9	14 3/4	14 5/8	13 7/16	9 3/4	15 1/4	7	3	4 3/4	102	Brownie
501	5 1/2	5 3/4	20	12 1/16	11 7/16	10 1/4	12 3/8	8	2 1/2	9 1/2	114	Bugle

TUYERES.

CLASS D

LONG.

All Weights given are Approximate.



DESCRIPTION.

a—Inside diameter at nose.

b— " " " butt.

L—Length over all.

B—Outside diameter at butt.

N— " " " nose.

S—Length of sleeve.

f— " beyond sleeve.

2½ INCH TUYERES.

No.	a	b	L	B	N	S	f	Wt.	Cypher.
131	2½	7½	28	10⅛	8	12½	15½	104	Baudana
416	2½	7½	28	10⅛	8	12½	15½	106	Brent

3½ INCH TUYERES.

No.	a	b	L	B	N	S	f	Wt.	Cypher.
170	3½	7½	28	10⅛	8	12½	15½	108	Barrack

4½ INCH TUYERES.

No.	a	b	L	B	N	S	f	Wt.	Cypher.
31	4½	7½	28	10⅛	8	12½	15½	112	Album
111	4½	8	28	11¼	9	8	20	126	Baize
142	4½	8	28	10¾	9	12½	15½	115	Batrian

5½ INCH TUYERES.

No.	a	b	L	B	N	S	f	Wt	Cypher.

3 INCH TUYERES.

No.	a	b	L	B	N	S	f	Wt.	Cypher.
29	3	7½	28	10⅛	8	12½	15½	104	Agent

4 INCH TUYERES.

No.	a	b	L	B	N	S	f	Wt.	Cypher.
30	4	7½	28	10⅛	8	12½	15½	110	Aisle
157	4	8	28	11¼	9	8	20	125	Barbarian
196	4	8½	28	10⅜	8	12½	15½	114	Bather

5 INCH TUYERES.

No.	a	b	L	B	N	S	f	Wt.	Cypher.
32	5	8	28	10¾	9	12½	15½	116	Alcove
33	5	8	28	11¼	9	8	20	130	Alder
208	5	7½	25	11¼	9	5	20	123	Bawble

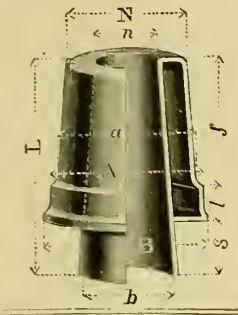
6 INCH TUYERES.

No.	a	b	L	B	N	S	f	Wt.	Cypher.

TUYERES.

CLASS E

All Weights given are Approximate



DESCRIPTION.

n—Inside diameter at nose.
b—" " " butt.
L—Length over all.
B—Outside diameter at butt.
A—" " " cooler bearing.
N—" " " nose.
S—Length of sleeve.
l—" " cooler bearing.
f—" " beyond cooler bearing.

4 INCH LONG TUYERES.

	No.	*n*	*b*	*L*	*B*	*A*	*a*	*N*	*S*	*l*	*f*	*Wt.*	*Cypher.*
4 in. Long.	110	4	8¾	18	12	10½	...	9¼	6	6	6	90	Bang

4½ INCH SHORT TUYERES.

	No.	*n*	*b*	*L*	*B*	*A*	*a*	*N*	*S*	*l*	*f*	*Wt.*	*Cypher.*
4½ in. Short	252	4½	5⅜	9¼	9 3/16	8¾	8½	8	1¼	3	5	49	Bema

4½ INCH MEDIUM AND LONG TUYERES.

	No.	*n*	*b*	*L*	*B*	*A*	*a*	*N*	*S*	*l*	*f*	*Wt.*	*Cypher.*
4½ in. Medium and Long.	163	4½	6⅞	16	12	10 7/16	10¼	9¼	4	3	9	70	Barker
	175	4½	8¾	18	12	10½	...	9¼	6	6	6	89	Barter

5 INCH SHORT TUYERES.

	No.	*n*	*b*	*L*	*B*	*A*	*a*	*N*
5 in. Short	314	5	5⅜	9¼	9 3/16	8¾	...	8

5 INCH MEDIUM AND LO[N]

	No.	*n*	*b*	*L*	*B*	*A*
5 in. Medium and Long.	71	5	6⅞	16	12	10
	95	5	8¾	18	12	
	368	5	8¾	16½	11⅛	
	689	5	8¾	16½	12	

6 INCH MED[IUM]

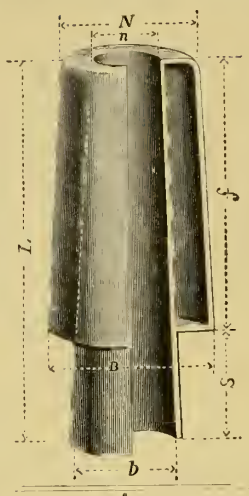
	No.	*n*	*b*
6 in. Medium and Long.	356	6	8
	707	6	

TUYERES.

CLASS D

LONG.

All Weights given are Approximate.



DESCRIPTION.

a—Inside diameter at nose.

b— " " " butt.

L—Length over all.

B—Outside diameter at butt.

N— " " " nose.

S—Length of sleeve.

f— " beyond sleeve.

2½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*S*	*f*	*Wt.*	*Cypher.*
131	2½	7½	28	10⅛	8	12½	15½	104	Bandana
416	2½	7½	28	10⅛	8	12½	15½	106	Brent

3½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*S*	*f*	*Wt.*	*Cypher.*
170	3½	7½	28	10⅛	8	12½	15½	108	Barrack

4½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*S*	*f*	*Wt.*	*Cypher.*
31	4½	7½	28	10⅛	8	12½	15½	112	Album
111	4½	8	28	11¼	9	8	20	126	Baize
142	4½	8	28	10¾	9	12½	15½	115	Batrian

5½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*S*	*f*	*Wt*	*Cypher.*

3 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*S*	*f*	*Wt.*	*Cypher.*
29	3	7½	28	10⅛	8	12½	15½	104	Agent

4 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*S*	*f*	*Wt.*	*Cypher.*
30	4	7½	28	10⅛	8	12½	15½	110	Aisle
157	4	8	28	11¼	9	8	20	125	Barbarian
196	4	8½	28	10⅛	8	12½	15½	114	Bather

5 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*S*	*f*	*Wt.*	*Cypher.*
32	5	8	28	10¾	9	12½	15½	116	Alcove
33	5	8	28	11¼	9	8	20	130	Alder
208	5	7½	25	11¼	9	5	20	123	Bawble

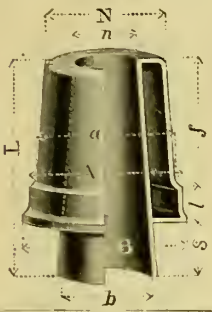
6 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*S*	*f*	*Wt.*	*Cypher.*

TUYERES.

CLASS E

All Weights given are Approximate



DESCRIPTION.

n—Inside diameter at nose.
b—" " " butt.
L—Length over all.
B—Outside diameter at butt.
A—" " " cooler bearing.
N—" " " nose.
S—Length of sleeve.
l—" " cooler bearing.
f—" " beyond cooler bearing.

4 INCH LONG TUYERES.

	No.	n	b	L	B	A	a	N	S	l	f	Wt.	Cypher.
4 in. Long	140	4	8 3/4	18	12	10 1/2	...	9 1/4	6	6	6	90	Bang

4½ INCH SHORT TUYERES.

	No.	n	b	L	B	A	a	N	S	l	f	Wt.	Cypher.
4½ in Short	252	4½	5 3/8	9 1/4	9 3/16	8 3/4	8 1/2	8	1 1/4	3	5	49	Bema

4½ INCH MEDIUM AND LONG TUYERES.

	No.	n	b	L	B	A	a	N	S	l	f	Wt.	Cypher.
4½ in. Medium and Long.	163	4½	6 7/8	16	12	10 7/16	10 1/4	9 1/4	4	3	9	70	Barker
	175	4½	8 3/4	18	12	10 1/2	...	9 1/4	6	6	6	89	Barter

5 INCH SHORT TUYERES.

	No.	n	b	L	B	A	a	N	S	l	f	Wt.	Cypher.
5 in. Short	314	5	5 3/8	9 1/4	9 3/16	8 3/4	...	8	1 1/4	3	5	45	Blonde

5 INCH MEDIUM AND LONG TUYERES.

	No.	n	b	L	B	A	a	N	S	l	f	Wt.	Cypher.
5 in. Medium and Long.	71	5	6 7/8	16	12	10		9 1/4	4	3	9		Arthur
	95	5	8 3/4	18	12		...	9 1/4	6	6	6	93	Badge
	368	5	8 3/4	16 1/2	11 1/8		...	9 5/8	7 1/2	3	6	75	Borure
	689	5	8 3/4	16 1/2	12	13/8	...	10 1/8	7 1/2	3		83	C

6 INCH MEDIUM AND LONG TUYERES.

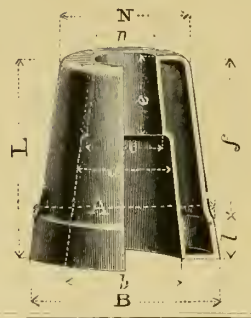
	No.	n	b		B	A	a	N	S
6 in. Medium and Long.	356	6	8	16 1/2	11 1/8	10 1/4	...		
	707	6		16 1/2	12 1/8	11 3/8			

TUYERES.

CLASS C

MEDIUM.

All Weights given are Approximate.



DESCRIPTION.

a—Inside diameter, at nose.
b " " " butt.
L—Length over all.
B—Outside diameter at butt.
A " " " cooler bearing.
N " " " nose.
l—Length of cooler bearing.
f " projecting beyond cooler.
e—Small diameter at nose contraction.
e—Length of " "
d—Large diameter " "

3½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*e*	*e*	*d*	*Wt.*	*Cypher.*
128	3½	7¾	15	12½	11¾	9¾	3½	11½	5¼	8	6⅝	95	Banco
245	3½	9	15	13¼	12½	11	3½	11½	6¾	6	7⅝	109	Belgian

4 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*e*	*e*	*d*	*Wt.*	*Cypher.*
149	4	7¾	15	12½	11¾	9¾	3½	11½	5¼	8	6⅝	96	Bannock

4½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*e*	*e*	*d*	*Wt.*	*Cypher.*
177	4½	7¾	15	12½	11¾	9¾	3½	11½	5¼	8	6⅝	97	Barton
224	4½	7	13½	13	12	9½	3	10½	6	5	6⅜	98	Beaufet

5 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*e*	*e*	*d*	*Wt.*	*Cypher.*
67	5	9	15	13¼	12½	11	3½	11½	6¾	6	7⅝	100	Attic
68	5	7¾	15	12½	11¾	9¾	3½	11½	5¼	8	6⅝	96	Auction
225	5	7	13½	13	12	9½	3	10½	6	5	6⅜	93	Beaufin
449	5	9	15	13¼	12½	11	3½	11½	6⅝	9¾	8⅜	112	Brocade

TUYERES.

CLASS C

MEDIUM.

All Weights given are Approximate.

DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A " " " cooler bearing.
N " " " nose.
l—Length of cooler bearing.
f " projecting beyond cooler.
c—Small diameter at nose contraction.
e—Length of " "
d—Large diameter " "

5½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*c*	*e*	*d*	*Wt.*	*Cypher.*
138	5½	9	15	13¼	12½	11	3½	11½	6¾	6	7⅝	100	Bandoline
226	5½	7	13½	13	12	9½	3	10½	6	5	6⅜	90	Beauty

6 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*c*	*e*	*d*	*Wt.*	*Cypher.*
73	6	9	15	13¼	12½	11	3½	11½	6¾	6	7⅝	106	Avenue
350	6	9	15	13¼	12½	11	3½	11½	6⅝	9¼	8⅜	109	Bombyx
390	6	7¾	15	12½	11¾	9¾	3½	11½	6¼	8	6⅝	100	Bracket
411	6	9	12	13¼	12½	11	3	9	7	7	8¼	93	Breather

6½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*c*	*e*	*d*	*Wt.*	*Cypher.*
146	6½	9	15	13¼	12½	11	3½	11½	6¾	6	7⅝	100	Banker
251	6½	9	19	13¼	12½	10½	3½	15½	6¾	10	7⅝	140	Beluga

7 INCH TUYERES.

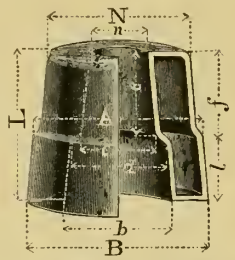
No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*c*	*e*	*d*	*Wt.*	*Cypher.*
3	6¾	9	15	13¼	12½	11	3½	11½	6¾	6	7⅝	100	Abatis

TUYERES.

CLASS C

SHORT.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b " " " butt.
L—Length over all.
B—Outside diameter at butt.
A " " " cooler bearing.
N " " " nose.
l—Length of cooler bearing.
f " projecting beyond cooler.
e—Small diameter at nose contraction.
e—Length of " "
d—Large diameter " "

3½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*e*	*e*	*d*	*Wt.*	*Cypher.*

4 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*e*	*e*	*d*	*Wt.*	*Cypher.*

4½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*e*	*e*	*d*	*Wt.*	*Cypher.*
220	4½	5¼	10½	10	9⅞	8¾	3	7½	4½	4	5⅛	56	Bear
233	4½	5½	11	10⅝	9¾	8⅝	3¼	7¾	4½	4	5¼	63	Bedouin

5 INCH TUYERES.

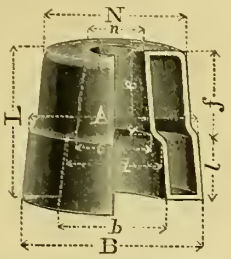
No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*e*	*e*	*d*	*Wt.*	*Cypher.*
126	5	8½	11	12⅞	11⅞	10½	5	6	5⅛	6	7½	82	Ban
349	5	7	11	11½	...	9⅝	...	...	5⅛	6	6¼	77	Bombate

TUYERES.

CLASS C

SHORT.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A " " " cooler bearing.
N " " " nose.
l—Length of cooler bearing.
f " projecting beyond cooler.
c—Small diameter at nose contraction.
e—Length of " "
d—Large diameter " "

5½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*c*	*e*	*d*	*Wt.*	*Cypher.*
109	5½	8½	11	12⅞	11⅞	10½	5	6	6	6	7½	80	Bairn

6 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*c*	*e*	*d*	*Wt.*	*Cypher.*
12	6	8½	11	12⅞	11⅞	10½	5	6	6	6	7½	84	Avenger
218	6	6⅞	11½	12⅞	12	10½	3½	8	6	2	6⅜	88	Beaker

6½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*c*	*e*	*d*	*Wt.*	*Cypher.*

7 INCH TUYERES.

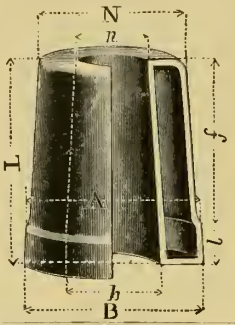
No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*c*	*e*	*d*	*Wt.*	*Cypher.*

TUYERES.

CLASS B

MEDIUM.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
N— " " " nose.
l—Length of cooler bearing.
f— " projecting beyond cooler.

6 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
11	6	7½	12	12	11¼	10½	3	9	80	Abstract
101	6	7	12	12⅛	11 7/16	10¼	2½	9½	80	Bagman
114	6	8	15	13¼	12¾	11	2½	12½	108	Balcony
202	6	7½	15	13¼	12¾	10	3	12	126	Batz
269	6	7¼	15½	13¼	12½	10½	3	12½	110	Beverage
292	6	7¼	15½	12	11¼	10¼	3	12½	100	Biter
304	6	8¼	15	13	11⅝	9⅞	3	12	100	Blemish
325	6	7	15	12⅛	11 7/16	10⅜	2½	12½	94	Boarder
333	6	7½	14	12	11¼	9⅞	3	11	89	Bobolink
339	6	8½	15	14½	12½	9⅞	6	9	160	Bodice
357	6	7½	12	12	11¼	10½	3	9	80	Bonten
359	6	7½	13	12 5/16	11½	9⅝	3	10	82	Boomerang
430	6	7¼	12	12	11¼	10½	3	9	85	Bridler
447	6	7¼	12	13¼	12½	10⅞	3	9	92	Broach
504	6	7	12	12	11¼	10⅛	3	9	80	Builder
538	6	8¼	12	12⅞	11⅞	10¼	3½	8½	92	Burgall
547	6	8	15	13¾	12⅝	11	3	12	111	Burlace
562	6	6½	12	11⅝	10¾	10	2½	9½	80	Buss
593	6	7½	12	13¼	12½	11¼	3	9	92	Cachalot
600	6	8	12	13¼	12¾	11¼	2½	9½	85	Caddow
655	6	7	15	13	11⅝	9⅞	3	12	106	Calumbine
659	6	6½	15½	13¼	12½	10¼	3	12½	112	Culvinist
688	6	7¼	12	13¼	12½	9⅞	3	9	92	Candidate
726	6¼	7½	12	13¼	12½	11¼	3	9	91	Captor

6½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
10	6½	7½	12	12	11¼	10½	3	9	79	Abcess
160	6½	8	15	13¼	12¾	11	2½	12½	110	Barcon
186	6½	8	15	13⅛	12¼	11¼	2¾	12¼	119	Basinet
320	6½	7	12	12⅛	11 7/16	10¼	2½	9½	85	Bluff
444	6½	8	12	13¼	12¾	11¼	2½	9½	85	Brisure

7 INCH TUYERES.

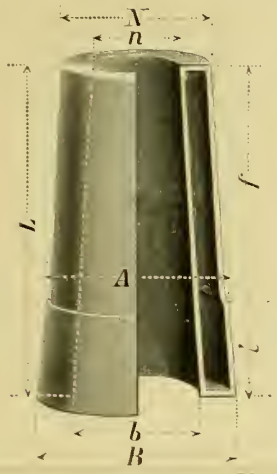
No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
4	7	8	15	13¼	12¾	11	2½	12½	105	Abbey
119	7	8	15	13⅛	12¼	11¼	2¾	12¼	122	Ballast
312	7	7½	12	12	11¼	10⅞	3	9	76	Blockade
345	7	8	15	13¾	12⅝	11	3	12	110	Bollard
450	7	8	12	13¼	12¾	11¼	2½	9½	80	Brocket
716	7	7½	12	13¼	12½	11¼	3	9	90	Capitule

TUYERES.

CLASS B

LONG.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
N— " " " nose.
l—Length of cooler bearing.
f— " projecting beyond cooler.

3 INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
355	3	7½	18	12	10½	8¾	6	12	100	Bonito

4 INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
85	4	7½	18	12	10½	8¾	6	12	105	Bac
561	4	7¼	18	13¼	12½	10¼	3	15	124	Buskin

4½ INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
86	4½	7½	18	12	10½	8¾	6	12	105	Bacca

5 INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
378	5	7½	17	12	11¼	10⅛	3	14	106	Bouncer

5½ INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
36	5½	9	32	13¾	12½	10¼	7	25	240	Almond
481	5½	7½	17	12	11¼	10⅛	3	14	115	Bryonine

6 INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
35	6	9	32	13¾	12½	10¼	7	25	238	Alley
159	6	8	22	15½	14¼	11½	3½	18½	190	Barber
212	6	7½	17	12	11¼	10⅛	3	14	109	Bayonet
550	6	8	15	12⅛	11½	10⅜	2½	12½	99	Burnet
554	6	8	18	13¾	12⅝	10⅛	3	15	136	Burrock
731	6	8	18	13¼	12¾	10¾	2½	15½	125	Caramel

6½ INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
34	6½	9	24	13¾	12½	10⅞	7	17	173	Alien
180	6½	8	22	15½	14¼	11½	3½	18½	188	Basalt

7 INCH TUYERES.

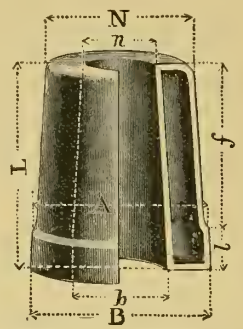
No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
59	7	8	22	15½	14¼	11½	3½	18½	190	Arena
611	7	9½	21	17¼	15¾	11⅜	6	15	192	Caimacan

TUYERES.

CLASS B

MEDIUM.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A " " " cooler bearing.
N " " " nose.
l—Length of cooler bearing.
f— " projecting beyond cooler.

3 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*Wt*	*Cypher.*
105	3	6	12	11 1/8	10 1/4	9 1/4	2 1/2	9 1/2	72	Bahar
139	3	5	12	10 1/8	9 1/4	8	2 1/2	9 1/2	88	Bane
297	3	7	12	12 1/8	11 7/16	9 3/8	2 1/2	9 1/2	80	Backleg
560	3	7 1/2	12	12	11 1/4	9 1/4	3	9	80	Basket

3½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*Wt*	*Cypher.*
144	3 1/2	6	15 1/2	11 1/2	11	7 3/4	3 1/2	12	79	Banjo
166	3 1/2	6	12	11 1/8	10 1/4	9 1/4	2 1/2	9 1/2	73	Barometer
184	3 1/2	5	12	10 1/8	9 1/4	8	2 1/2	9 1/2	69	Bashaw

4 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*Wt*	*Cypher.*
62	4	6	15 1/2	11 1/2	11	7 3/4	3 1/2	12	79	Arrow
120	4	7 1/2	12	12	11 1/4	9 1/4	3	9	75	Ballet
130	4	6 3/8	12	12	10 3/4	9 1/2	2 1/4	9 3/4	78	Bandage
134	4	7	12	12 1/8	11 7/16	9 3/8	2 1/2	9 1/2	87	Bandit
169	4	6	12	11 1/8	10 1/4	9 1/4	2 1/2	9 1/2	74	Baroscope
181	4	5	12	10 1/8	9 1/4	8	2 1/2	9 1/2	70	Basanite
573	4	8 1/2	15	14 1/2	12 1/2	9 7/8	6	9	114	Buzzardet
596	4	8 1/4	12	12 7/8	11 7/8	10 1/4	3 1/2	8 1/2	90	Cashalong

4½ INCH TUYERES.

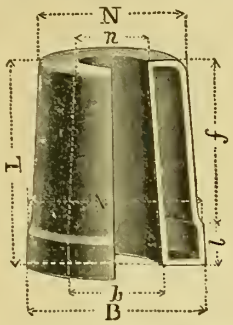
No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*Wt*	*Cypher.*
5	4 1/2	7 1/2	12	12	11 1/4	9 1/4	3	9	72	Abbot
132	4 1/2	7 1/2	12	11 7/8	11 1/16	9 1/4	3 1/4	8 3/4	76	Bandbox
133	4 1/2	8	14	12 1/8	11 1/16	9 1/4	3	11	90	Bander
141	4 1/2	6 3/8	12	12	10 3/4	9 1/2	2 1/4	9 3/4	104	Bangle
171	4 1/2	6	12	11 1/8	10 1/4	9 1/4	2 1/2	9 1/2	75	Barrel
188	4 1/2	7	12	12 1/8	11 7/16	9 3/8	2 1/2	9 1/2	80	Baslard
660	4 1/2	8 1/2	15	14 1/2	12 1/2	9 7/8	6	9	119	Calycle

TUYERES.

CLASS B

MEDIUM.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b— " " " butt.
L—Length over all.
B—Outside diameter at butt.
A— " " " cooler bearing.
N— " " " nose.
l —Length of cooler bearing.
f — " projecting beyond cooler.

5 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
6	5	7½	12	12	11¼	9¼	3	9	72	Abhal
25	5	6⅜	12	12	10¼	9½	2¼	9¾	80	Adult
37	5	8	14	12⅛	11 1/16	9¼	3	11	90	Aloe
94	5	7½	12	11⅞	11 1/16	9¼	3¼	8¾	77	Baculite
115	5	7	12	12⅛	11 7/16	9⅜	2½	9½	79	Bale
123	5	8½	15	14½	12½	9⅞	6	9	110	Ballow
156	5	8	15	13¼	12¾	11	2½	12½	110	Barbacan
165	5	6	12	11⅛	10¼	9¼	2½	9½	76	Barnacle
264	5	7	15	12⅛	11 7/16	9	2½	12½	95	Berme
335	5	7½	14	12	11¼	9⅞	3	11	92	Bocal
377	5	7½	13	12 5/16	11½	9⅝	3	10	78	Bough
535	5	7¼	12	13¼	12½	10⅞	3	9	96	Burdener
570	5	8¼	12	12⅞	11⅞	10¼	3½	8½	88	Buxine
595	5	7¼	15½	13¼	12½	10½	3	12½	112	Cachiri
615	5	7½	12	13¼	12½	11¼	3	9	84	Caitiff
678	5¼	7½	15½	12	11¼	10¼	3	9	96	Campana

5½ INCH TUYERES.

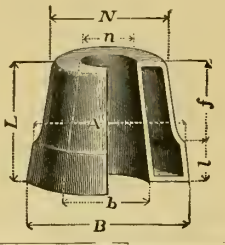
No.	*n*	*b*	*L*	*B*	*A*	*N*	*l*	*f*	*Wt.*	*Cypher.*
2	5½	8½	15	14½	12½	9⅞	6	9	110	Abandon
103	5½	8	15	13¼	12¾	11	2½	12½	108	Bagnio
201	5½	7½	15	13¼	12¾	10	3	12	110	Batton
301	5½	6½	13½	11⅛	10¼	9½	3	10½	79	Blazer
334	5½	7½	14	12	11¼	9⅞	3	11	90	Bobtail
491	5½	7	12	12⅛	11 7/16	10¼	2½	9½	82	Buddhist
536	5½	7¼	12	13¼	12½	10⅞	3	9	90	Burdock
537	5½	8¼	12	12⅞	11⅞	10¼	3½	8½	90	Bureau
552	5½	6½	12	11⅝	10¾	10	2½	9½	80	Burnoose
609	5½	8¼	14½	12⅞	11⅞	9¾	3½	11	98	Cagmag
691	5½	7	12	12¼	11¼	9¾	3½	8½	80	Candle

TUYERES.

CLASS B

SHORT.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b " " " butt.
L—Length over all.
B—Outside diameter at butt.
A " " " cooler bearing.
N " " " nose.
l—Length of cooler bearing.
f " projecting beyond cooler.

3 INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
206	3	6⅞	9	11⅜	11	9¼	3	6	57	Bavarian

3½ INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
506	3½	6	6	11	10½	8½	3	3	40	Bulbel

4 INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
152	4	6⅞	9	11⅜	11	9¼	3	6	55	Bantam
246	4	6	9	11⅝	10⅞	9⅝	2½	6½	67	Belial
469	4	6⅞	9	11	10½	9¼	3	6	57	Brother
715	4	7	10	13¼	12½	10½	3	7	83	Capitalist

4½ INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
185	4½	6⅞	9	11¼	10½	9¼	3	6	54	Basil
676	4½	8¼	8	12⅞	11⅞	11	3½	4½	69	Cammock

5 INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
82	5	6⅞	9	11¼	10½	9¼	3	6	56	Babel
104	5	6½	6½	11⅝	10⅞	10⅛	2½	4	53	Bagpipe
135	5	6⅞	6½	12⅛	11¼	10¾	2½	4	50	Bandle
234	5	5½	11	10⅝	9¾	8⅝	3¼	7¾	65	Bedroom
306	5	6⅞	9	11⅞	11 3/16	9¼	3	6	56	Bletonist
548	5	5⅝	9	11½	10½	9¾	3	6	59	Burler
557	5	7⅞	8	13½	12¾	10¾	3	5	68	Burton
583	5	7½	9	12	11 3/16	9¾	3	6	60	Cabiai
607	5	7	10	13¼	12½	10½	3	7	76	Cage
728	5	8	10	12⅛	11 1/16	9⅞	3	7	78	Capuchin

5 INCH TUYERES.

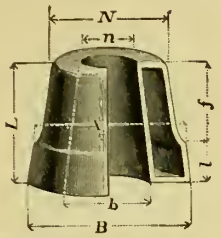
No.	n	b	L	B	A	N	l	f	Wt.	Cypher.

TUYERES.

CLASS B

SHORT.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.
b " " " butt.
L—Length over all.
B - Outside diameter at butt.
A " " " cooler bearing.
N " " " nose.
l—Length of cooler bearing.
f " projecting beyond cooler.

5½ INCH TUYERES.

No	n	b	L	B	A	N	l	f	Wt.	Cypher.
89	5½	6½	6½	11⅝	10⅞	10⅛	2½	4	54	Backbone
179	5½	6⅞	6½	12⅛	11¼	10¾	2½	4	45	Barytone
398	5½	5⅝	9	11½	10½	9¾	3	6	59	Braud
514	5½	8¼	9	13	11 3/16	10½	4	5	75	Bullfice
517	5½	6½	10	12	11¼	10	3	7	67	Bultel
584	5½	6	9	12¾	11⅞	10⅜	3	6	69	Cabin
622	5½	6	11	12¾	11⅞	10	3	8	80	Calamish
636	5½	6½	10	12	10 7/16	9½	3	7	65	Caliber

6 INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
90	0	6⅞	6½	12⅛	11¼	10¾	2½	4	44	Backer
303	6	8¼	9	13	11⅝	10¾	3	6	73	Bleacher
343	6	7½	9	12	11¼	10¼	3	6	62	Boiler
360	6	7½	10	12 5/16	11½	10⅛	3	7	72	Booser
109	6	6¼	9	12½	11½	9¾	3	6	67	Breaker
145	6	7	8½	13⅛	12½	11¼	2½	6	72	Britannia
466	6	7⅛	10	12	11¼	11	3	7	67	Brookmint
474	6	8⅛	8½	13¼	12½	11½	3	5½	75	Bruise
513	6	8¼	9	13	11 13/16	10½	4	5	76	Bulletin
576	6	7¼	10	13¼	12½	10½	3	7	80	Cabal
581	6	8⅛	7	13½	12½	10¼	3	4	70	Cabason
606	6	7	10	13¼	12½	10½	3	7	81	Cafenet
647	6	6½	10	12	11¼	10	3	7	70	Caller
700	6	8¼	8	12⅞	11⅞	11	3½	4½	50	Cannonade
701	6	7	8	12⅛	11½	10⅝	2½	5½	64	Canoe
717	6	7½	10	12	11¼	11	3	7	71	Capoch
723	6	8	10	12⅛	11 1/16	9⅞	3	7	77	Capsule

6½ INCH TUYERES.

No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
642	6½	8¼	8	12⅞	11⅞	11	3½	4½	67	Calipers

7 INCH TUYERES.

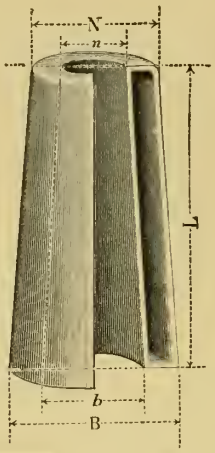
No.	n	b	L	B	A	N	l	f	Wt.	Cypher.
296	7	7⅛	10	12	11¼	11	3	7	64	Blackcap
439	7	8¼	9	13	11⅝	10¾	3	6	50	Brimstone

TUYERES.

CLASS A

LONG.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.

b " " " butt.

L—Length over all.

B—Outside diameter at butt.

N— " " " nose.

2½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
18	2½	5	20	9	7	69	Acre.
147	2½	5½	20	10¼	7¾	95	Bankrupt.

3 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
21	3	6½	20	10⅞	8	105	Adamite.
162	3	5½	20	10¼	7¾	92	Bargain.
270	3	4¾	18	8¾	7	70	Bias.
317	3	7½	20	12	9¼	123	Blotter.
654	3	6	30	11	8	146	Calumba.
675	3	5	24	9	6⅝	90	Cammas.

3½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
19	3½	5½	20	10¼	7¾	94	Actor.
75	3½	8	18	12¼	8¼	105	Awl.
110	3½	6½	20	10⅞	8	97	Bait.
639	3½	7½	22	12	9	138	Calin.

4 INCH TUYERES.

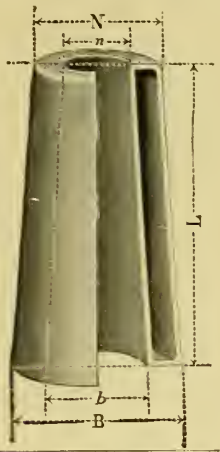
No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
20	4	6½	20	10⅞	8	104	Actress.
76	4	8	18	12¼	8¼	105	Awning.
106	4	7⅛	20	11¼	9	103	Bail.
117	4	7½	20	12	9¼	125	Balk.
161	4	7½	22	12	9	130	Barfee.
308	3¾	6	30	11	8	150	Blinker.
313	4	6	24	10	7	110	Blomary.
386	4	6	24	10¼	7¼	80	Boxer.
549	4	7½	24	12	8¾	150	Burlesque.

TUYERES.

CLASS A

LONG.

All Weights given are Approximate.



DESCRIPTION.

n—Inside diameter at nose.

b " " " butt.

L—Length over all.

B—Outside diameter at butt.

N " " " nose.

4½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
88	4½	7½	22	12	9	133	Bachelor.
91	4½	8	28	12⅛	9	170	Backset.
168	4½	7½	20	12	9¼	121	Baronet.
183	4½	7⅛	20	11¼	9	104	Basement.
305	4½	8½	18	13¾	10⅜	138	Blenny.
358	4½	7	18	11	9	100	Booley.
364	4½	7½	24	12	8¾	136	Borate.
429	4½	6	30	11	8	137	Bridge.

5 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
1	5	7½	20	12	9¼	120	Abacus.
17	5	7⅛	20	11¼	9	105	Acorn.
235	5	8	28	12⅛	9	166	Bedstead.
263	5	8	24	12¾	9½	150	Berlin.
282	5¼	7⅛	18	11¼	9¼	102	Binnacle.
283	5	8½	18	13¾	10⅜	135	Binot.
307	5	7	18	11	9	100	Bleyme.

5½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*

6 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
257	6	8½	18	13¾	10⅜	136	Benefit.
271	6	7	22	11½	10¼	139	Biceps.

6½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*

7 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
255	7	9	26½	13¾	11½	210	Bender.

TUYERES.

CLASS A

MEDIUM.

All Weights given are Approximate.

DESCRIPTION.

n—Inside diameter at nose.

b " " " butt.

L—Length over all.

B—Outside diameter at butt.

N " " " nose.

2½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
108	2½	6□	15½	10⅛	8	90	Bailiff.

3 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
13	3	6	15½	10⅛	8	76	Acacia.
446	3¼	6	15½	10⅛	8	80	Briton.
519	3¼	7	16	11	8	79	Bulwark.

3½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
63	3½	6	15½	10⅛	8	75	Arsenal.
127	3½	7	16	11	8	90	Banana.

4 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
14	4	6	15½	10⅛	8	80	Access.
98	4	7	16	11	8	78	Baffle.

4½ INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
15	4½	6	15½	10⅛	8	79	Account.
129	4½	6⅝	15½	10¾	9	88	Band.

5 INCH TUYERES.

No.	*n*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
16	5	6⅝	15½	10¾	9	81	Acid.
189	5	7	15½	11	9½	83	Basque.
248	5	7	15½	11⅜	9¼	98	Believer.
321	5	6½	13	10⅜	9	71	Blunder.
332	5	7⅞	12	13⅜	10½	92	Bobbinet.
341	5	6	12	11¼	9½	76	Bohea.
507	5	7	16	11	9¼	98	Bulblet.

TUYERES.

CLASS A

MEDIUM.

All Weights given are Approximate.

DESCRIPTION.

a—Inside diameter at nose.
b " " " butt.
L—Length over all.
B—Outside diameter at butt.
N " " " nose.

5½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
12	5½	7½	12	12	9	78	Abyss.
61	5½	7	15½	11	9½	84	Armor.
697	5½	7⅞	16	13⅜	9½	104	Cannabis.
510	5½	6	12	12	9	80	Bulker.

6 INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
60	6	9	14	13⅜	10½	112	Armada.
230	6	8	15	13¼	11	115	Beckon.
311	6	8¼	12	13	11½	101	Block.
677	6	7⅞	12	13⅜	10½	87	Camomile.

6½ INCH TUYERES.

No.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*

7 INCH TUYERES.

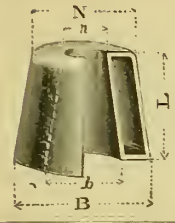
No.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
231	7	8	15	13¼	11	116	Bedder.
353	7	8¼	12	13⅜	10½	98	Bondue.

TUYERES.

CLASS A

SHORT.

All Weights given are Approximate.



DESCRIPTION.

a—Inside diameter at nose.
b " " " butt.
L—Length over all.
B—Outside diameter at butt.
N " " " nose.

2½ INCH TUYERES.

Number.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*

3 INCH TUYERES.

Number.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*

3½ INCH TUYERES.

Number.	*a*	*b*	*L*	*B*	*N*	*Wt*	*Cypher.*
176	3½	5½	8	10¼	9¼	47	Baritzan.

4 INCH TUYERES.

Number.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
121	4	5½	8	10¼	9¼	47	Ballister.
143	4	6½	6	12	10	45	Banisher.
195	4	7½	9	12	9¾	59	Batch.

4½ INCH TUYERES.

Number.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
87	4½	5½	8	10¼	9¼	48	Bacchus.
182	4½	6½	6	12	10	45	Base.
207	4½	7½	9	12	9¾	60	Bavaroy.
637	4½	5¼	6	12	10⅛	48	Calico.

5 INCH TUYERES.

Number.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
99	5	6½	6	12	10	46	Bag.
209	5	7½	9	12	9¾	60	Bawd.

5½ INCH TUYERES.

Number.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
262	5½	7½	9	12	9¾	60	Bergmote.

6 INCH TUYERES.

Number.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
465	6	7	10	11½	10⅝	70	Brooklime.
695	6	6½	6	12	10	46	Canine.

6½ INCH TUYERES.

Number.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*
376	6½	7½	9	12	9¾	58	Boudoir.

7 INCH TUYERES.

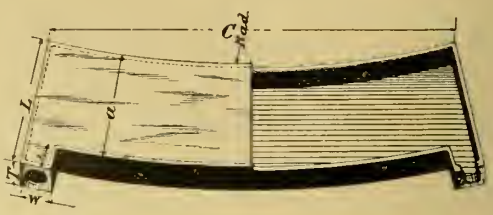
Number.	*a*	*b*	*L*	*B*	*N*	*Wt.*	*Cypher.*

INDEX—Continued.

BOSH PLATES.—CONTINUED.

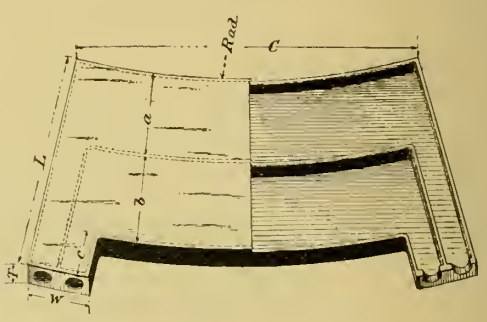
CLASS E.

Page 52



CLASS F.

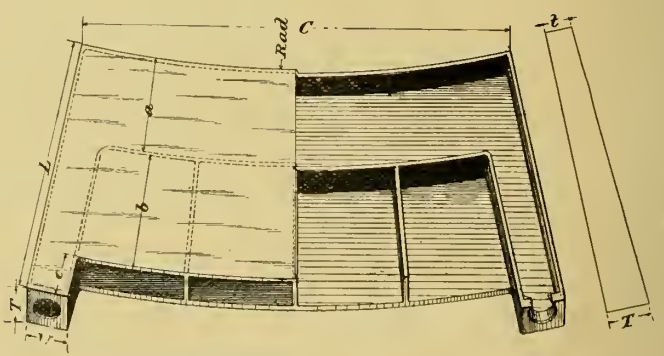
Page 53



CLASS G.

(GAYLEY'S PATENT.)

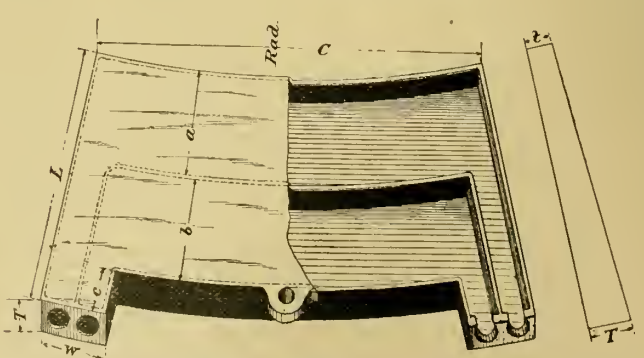
Pages ..... 54, 80 and 81



CLASS H.

(GAYLEY'S PATENT.)

Page 55

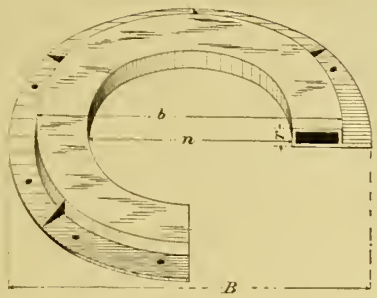


INDEX—Continued.

HOT BLAST VALVE SEATS.

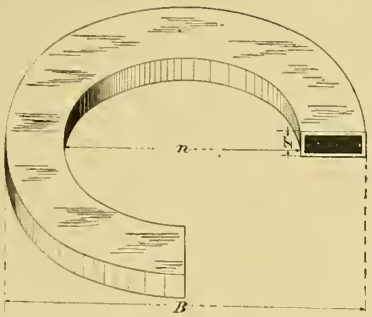
CLASS A.

Page 58



CLASS B.

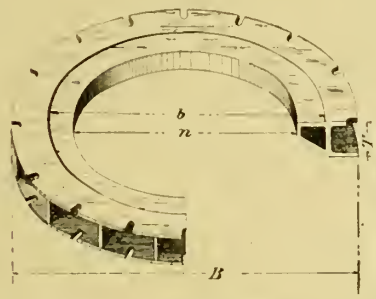
Page 58



CLASS C

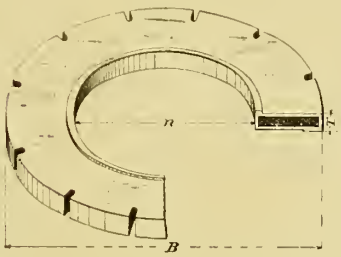
BERRY'S PATENT.

Page.....59



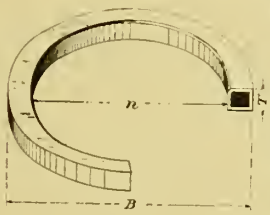
CLASS D.

Page.....59



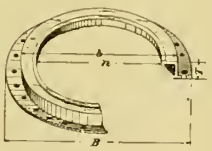
CLASS E.

Page.....60

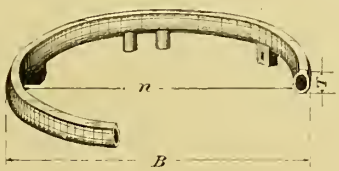


CLASS F.

Page.....60



CLASS G.

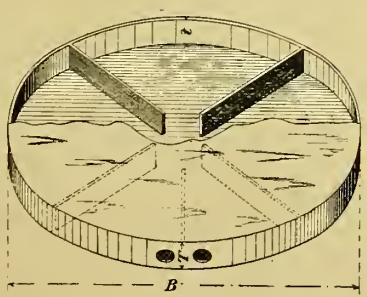


Page.....61

HOT BLAST VALVES.

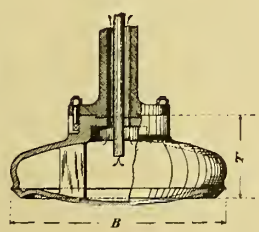
CLASS A.

Page.....63



CLASS B.

Page 64



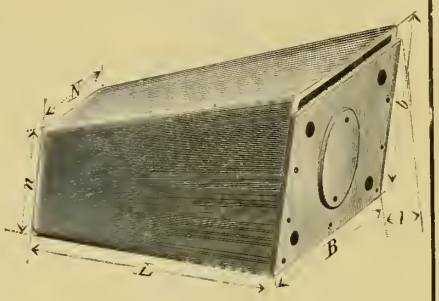
INDEX—Continued.

BOSH BOXES.

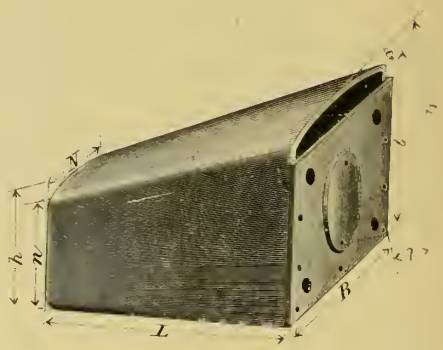
FRONHEISER'S PATENT.

CLASS A.

Pages 43, 70 and 71.



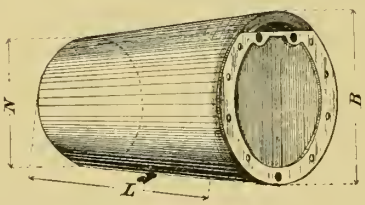
CLASS B.



Page..... 44

CLASS C.

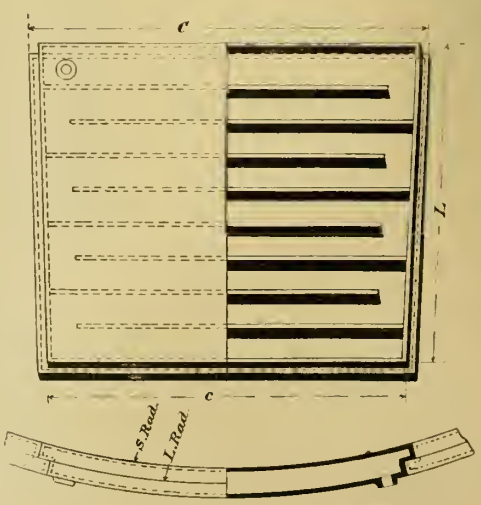
Pages...45, 70 and 71



HEARTH AND BOSH JACKET.

HUNT'S PATENT.

Pages ....46, 76 and 77.



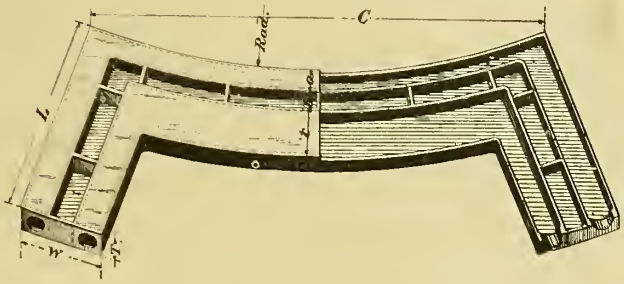
INDEX—Continued.

BOSH PLATES.

CLASS A.

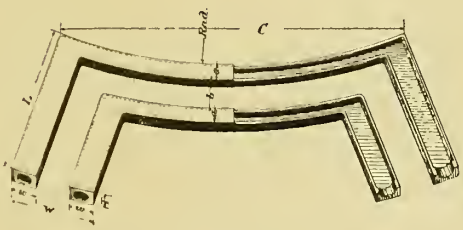
(KENNEDY'S PATENT.)

Pages ..... 47, 68 and 69



CLASS B.

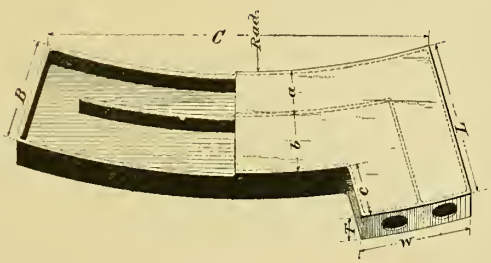
Page 49



CLASS C.

(POLLOCK'S PATENT.)

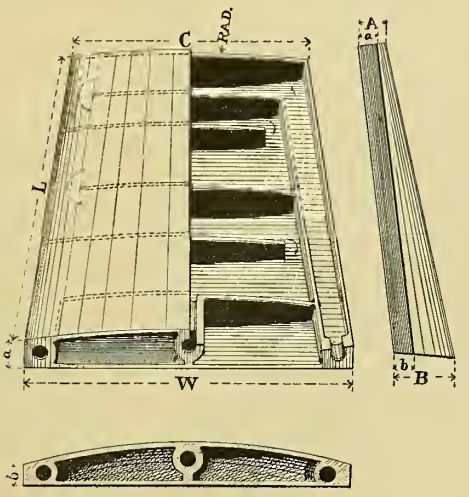
Pages ..... 50, 74 and 75



CLASS D.

(SCOTT'S PATENT.)

Pages ..... 51, 78 and 79



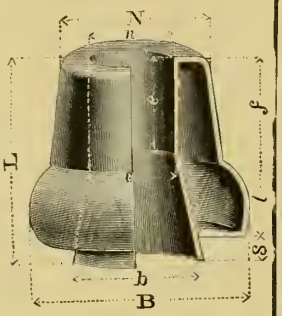
INDEX—Continued.

TUYERES.—CONTINUED.

SHORT—Less than 12 in. long. *MEDIUM*—Between 12 and 16 in. long. *LONG*—Over 16 in. long.

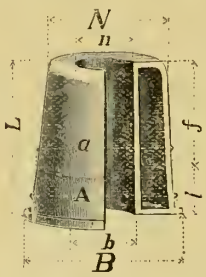
CLASS H.

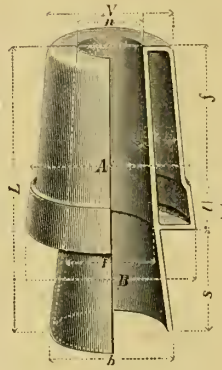
Page.....25



CLASS J.

Page.....27





CLASS I.

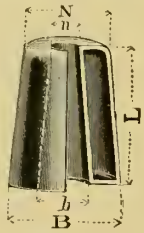
Page.....26

CINDER NOTCHES.

SHORT—Less than 10 in. long. *MEDIUM*—Between 10 and 15 in long. *LONG*—Over 15 in. long.

CLASS A.

Short, Medium and Long.....Page 30

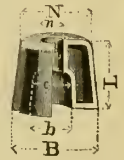


CLASS B.

Short and Medium.....Page 31

CLASS C.

Short and Long.....Page 32



CLASS D.

Page.....32

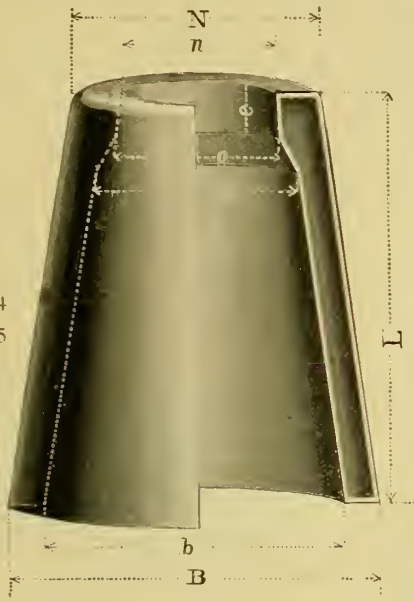
INDEX—Continued.

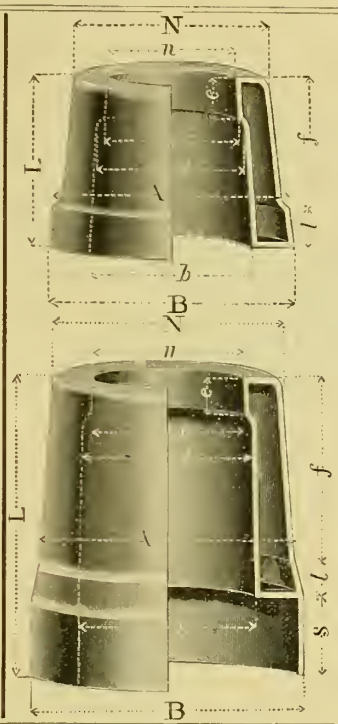
COOLERS.

SHORT—Less than 22 in. long. *LONG*—Over 22 in. long.

CLASS A.

Short .....Page 34
Long .....Pages 35 and 36





CLASS B.

Page.....37

CLASS F.

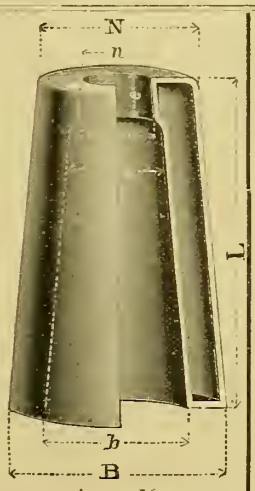
Page.....38

CINDER NOTCH COOLERS.

SHORT—Less than 12 in. long. *MEDIUM*—Between 12 and 16 in. long. *LONG*—Over 16 in. Long.

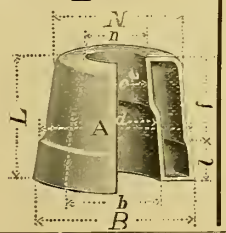
CLASS C.

Short and Medium.....Page 40

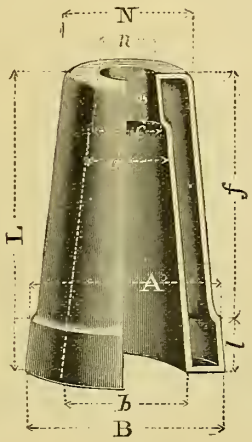


CLASS D.

Short and Medium.....Page 41



CINDER NOTCH COOLERS.



CLASS D.

Long.....Page 42

INDEX—Continued.

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

No.	Cypher.	Description.	Class.	Page.
901	Chantress			
902	Chape			
903	Chapeau			
904	Chaperon			
905	Chaplain			
906	Chaplet			
907	Chapter			
908	Chaptrel			
909	Character			
910	Charade			
911	Charbon			
912	Charge			
913	Chariot			
914	Charioteer			
915	Charlatan			
916	Charlock			
917	Charm			
918	Charmer			
919	Charon			
920	Chart			
921	Charter			
922	Charterer			
923	Chartist			
924	Chartreux			
925	Chase			
926	Chasm			
927	Chastener			
928	Chastiser			
929	Chasuble			
930	Chateau			
931	Chaterer			
932	Chatwood			
933	Chauffer			
934	Checker			
935	Cheerer			
936	Cheese			
937	Cheetah			
938	Chekoa			
939	Chelonian			
940	Chemist			
941	Cherisher			
942	Cheroot			
943	Cherub			
944	Chervil			
945	Chessel			
946	Chestnut			
947	Chetwert			
948	Chevrette			
949	Chevron			
950	Chewink			
951	Chibbal			
952	Chicken			
953	Chickadee			
954	Chicory			
955	Chider			
956	Chief			
957	Chieftan			
958	Chigoe			
959	Chilli			
960	Chilopod			
961	Chimer			
962	Chimney			
963	Chip			
964	Chipmunk			
965	Chiropod			
966	Chirper			
967	Chisel			
968	Chloris			
969	Choir			
970	Choker			
971	Chooser			
972	Chopper			
973	Choral			
974	Chorus			
975	Chub			
976	Chuck			
977	Chuckle			
978	Chump			
979	Church			
980	Churn			
981	Cigar			
982	Cilice			
983	Cimeter			
984	Cinder			
985	Cinnamon			
986	Cypher			
987	Circle			
988	Circuit			
989	Circular			
990	Circus			
991	Cirriped			
992	Cissoid			
993	Cistern			
994	Citadel			
995	Citator			
996	Citizen			
997	Citron			
998	Civet			
999	Civilian			
1000	Claimer			

INDEX—TUYERES.

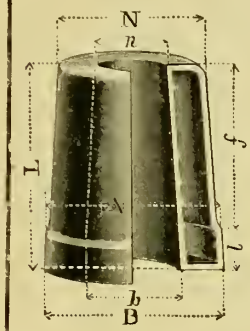
SHORT—Less than 12 in. long. *MEDIUM*—Between 12 and 16 in. long. *LONG*—Over 16 in. long.

CLASS A.

Short.....Pages 1
Medium..... " 2 and 3
Long..... " 4 and 5

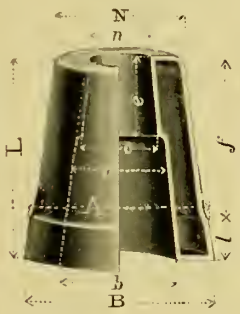
CLASS B.

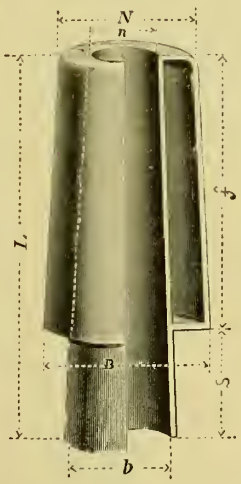
Short..... ...Pages 6 and 7
Medium..... " 8, 9 and 10
Long..... " 11



CLASS C

Short.....Pages 12 and 13
Medium..... " 14 and 15
Long..... " 16 and 17



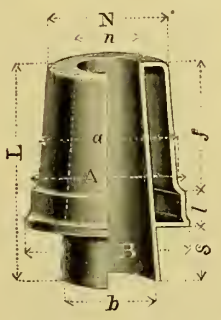


CLASS D.

Long.....Page 18

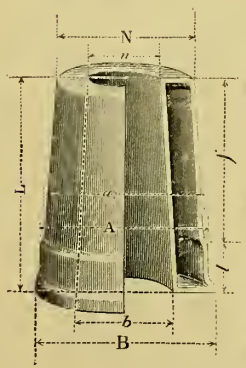
CLASS E.

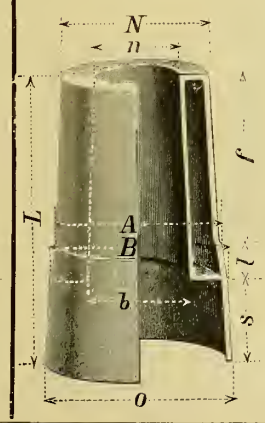
Page 19



CLASS G.

Pages ....23 and 24





CLASS F.

Long.....Pages 20, 21 and 22

INDEX—Continued.

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

No.	Cypher.	Description.	Class.	Page.
701	Canoe	6 inch Tuyere	B	7
702	Canonist	Notch Cooler	C	40
703	Canopy	Bosh Plate	D	51
704	Cantar	" Box	B	44
705	Canteen	Valve	B	64
706	Canticle	Long Cooler	A	35
707	Cantlet	6 inch Tuyere	E	19
708	Canton	Bosh Plate	E	52
709	Canvas	" "	E	52
710	Canvasser	" "	E	52
711	Canyon	" "	D	51
712	Capelan	" "	D	51
713	Capias	" "	D	51
714	Capital	5½ inch Tuyere	I	26
715	Capitalist	4 " "	B	6
716	Capitule	7 " "	B	10
717	Capoch	6 " "	B	7
718	Caponet	Notch	D	32
719	Capote	Short Cooler	A	34
720	Caprifole	Valve Seat	C	59
721	Capsicum	Bosh Plate	A	47
722	Capstan	5 inch Tuyere	G	23
723	Capsule	6 " "	B	7
724	Captain	Valve Seat	C	59
725	Captive	Notch	A	30
726	Captor	6¼ inch Tuyere	B	10
727	Capture	Bosh Plate	D	51
728	Capuchin	5 inch Tuyere	B	6
729	Caracal	Bosh Plate	G	54
730	Carafe	Notch	B	31
731	Caramel	6 inch Tuyere	B	11
732	Caraux	Notch		
733	Carapace			
734	Caravan			
735	Caravancer			
736	Caravel			
737	Caraway			
738	Carbine			
739	Carbineer			
740	Carbonate			
741	Carboy			
742	Carbuncle			
743	Carburet			
744	Carcajon			
745	Carcanet			
746	Carcass			
747	Cardamine			
748	Carder			
749	Cardinal			
750	Cardioid			
751	Cardoon			
752	Career			
753	Carees			
754	Cargo			
755	Caribou			
756	Carillon			
757	Carina			
758	Carlin			
759	Carlock			
760	Carman			
761	Carnation			
762	Carnelian			
763	Carnival			
764	Carnivore			
765	Caroche			
766	Caroon			
767	Caroteel			
768	Carouser			
769	Carpenter			
770	Carper			
771	Carpolite			
772	Carriage			
773	Carrier			
774	Carronade			
775	Carrow			
776	Carter			
777	Cartesian			
778	Carthamus			
779	Cartilage			
780	Cartoon			
781	Cartridge			
782	Cartulary			
783	Cartwright			
784	Carucate			
785	Carver			
786	Casarca			
787	Cascabel			
788	Cascade			
789	Cascarilla			
790	Casement			
791	Casern			
792	Cashier			
793	Cashoo			
794	Casing			
795	Casket			
796	Casque			
797	Cassava			
798	Cassida			
799	Cassine			
800	Cassock			

INDEX—Continued.

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

No.	Cypher.	Description.	Class.	Page.
801	Cassonade			
802	Cassowary			
803	Castanet			
804	Castellan			
805	Caster			
806	Castilian			
807	Casting			
808	Castle			
809	Casuist			
810	Cataclysm			
811	Catacomb			
812	Catadrome			
813	Catadupe			
814	Catagraph			
815	Catalan			
816	Catalogue			
817	Catalpa			
818	Catamaran			
819	Catamount			
820	Catapasm			
821	Catapult			
822	Cataract			
823	Catawba			
824	Catcher			
825	Catechine			
826	Category			
827	Cateran			
828	Caterer			
829	Cathedral			
830	Catkin			
831	Catsup			
832	Caucasian			
833	Caudex			
834	Caulis			
835	Cause			
836	Cavalier			
837	Caveat			
838	Caveson			
839	Cavetto			
840	Cavicorn			
841	Cavity			
842	Caxton			
843	Cedar			
844	Celandine			
845	Celebrator			
846	Cellar			
847	Cellaret			
848	Cellipore			
849	Cembalo			
850	Cementer			
851	Censer			
852	Centaur			
853	Centesm			
854	Centipede			
855	Centner			
856	Centurion			
857	Century			
858	Cephalate			
859	Cerastes			
860	Cerberus			
861	Cereal			
862	Cerebel			
863	Cerecloth			
864	Cerement			
865	Ceriph			
866	Cessment			
867	Cessor			
868	Cestus			
869	Cetacean			
870	Ceterach			
871	Cetine			
872	Cetrarine			
873	Ceylanite			
874	Ceylonese			
875	Chafer			
876	Chaffinch			
877	Chain			
878	Chainlet			
879	Chair			
880	Chairman			
881	Chaise			
882	Chalaze			
883	Chaldean			
884	Chalder			
885	Chaldron			
886	Chalice			
887	Chalk			
888	Challenge			
889	Challis			
890	Chamber			
891	Chambril			
892	Chameleon			
893	Chamois			
894	Chandelier			
895	Chandler			
896	Chanfrin			
897	Changer			
898	Channel			
899	Chant			
900	Chanter			

900

INDEX—Continued.

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

No.	Cypher.	Description.	Class.	Page.
501	Bugle	5½ inch Tuyere	F	21
502	Bugloss	Long Cooler	A	36
503	Buhl	5 inch Tuyere.	J	27
504	Builder	6 " "	B	10
505	Bulb	Notch Cooler	E	40
506	Bulbel	3½ inch Tuyere.	B	6
507	Bulblet	5 " "	A	2
508	Bulbule	Cooler	...	...
509	Bulchin	Bosh Box	A	43
510	Bulker	5½ inch Tuyere	A	3
511	Bullary	Cooler	B	37
512	Bullet	Long Cooler	A	35
513	Bulletin	6 inch Tuyere	B	7
514	Bullfice	5½ " "	B	7
515	Bullion	Bosh Box	C	45
516	Bulrush	Notch	B	31
517	Bultel	5½ inch Tuyere.	B	7
518	Bultow	Long Cooler	A	35
519	Bulwark	3¼ inch Tuyere	A	2
520	Bumble	5 " "	J	27
521	Bumboat	Bosh Plate	B	49
522	Bumkin	" "	B	49
523	Bummer	" "	B	49
524	Bump	" "	B	49
525	Bumper	" "	B	49
526	Bunch	" "	B	49
527	Bundle	Notch Cooler	D	42
528	Bungalow	Notch	D	32
529	Bunker	Long Cooler	A	35
530	Buntline	Cooler	B	37
531	Bunyon	Bosh Plate	G	54
532	Buoy	" "	G	54
533	Burbot	Valve	A	63
534	Burden	Notch	A	30
535	Burdener	5 inch Tuyere.	B	9
536	Burdock	5½ " "	B	9
537	Bureau	5½ " "	B	9
538	Burgall	6 " "	B	10
539	Burgee	4½ " "	J	27
540	Burgeois	Bosh Box	C	45
541	Burgher	" Plate	F	53
542	Burglar	" "	F	53
543	Burgonet	" "	H	55
544	Burgrass	4½ inch Tuyere.	J	27
545	Burgrave	5 " "	J	27
546	Burin	Notch Cooler	C	40
547	Burlace	6 inch Tuyere	B	10
548	Burler	5 " "	B	6
549	Burlesque	4 " "	A	4
550	Burnet	6 " "	B	11
551	Burnisher	Notch Cooler	D	41
552	Burnoose	5½ inch Tuyere	B	9
553	Burrel	Notch Cooler	D	42
554	Burrock	6 inch Tuyere.	B	11
555	Burrow	Notch Cooler	D	42
556	Bursar	Long "	A	35
557	Burton	5 inch Tuyere	B	6
558	Busby	Notch Cooler	D	42
559	Bushel	" "	C	40
560	**Basket**	3 inch Tuyere.	B	8
561	Buskin	4 " "	B	11
562	Buss	6 " "	B	10
563	Buster	Bosh Plate	E	52
564	Butcher	" "	E	52
565	Butler	" "	E	52
566	Butternut	6 inch Tuyere.	G	24
567	Buttery	6 " "	G	24
568	Buttock	Long Cooler	A	35
569	Buttress	Notch	B	31
570	Buxine	5 inch Tuyere.	B	9
571	Buyer	Bosh Plate	G	54
572	Buzzard	" "	G	54
573	Buzzardet	4 inch Tuyere.	B	8
574	Byard	Notch	B	31
575	Byzant	"	D	32
576	Cabal	6 inch Tuyere.	B	7
577	Cabalist	Bosh Plate	G	54
578	Caballer	" "	G	54
579	Caballine	Short Cooler	A	34
580	Cabaret	Valve Seat	C	59
581	Cabasson	6 inch Tuyere.	B	7
582	Cabbage	Notch	D	32
583	Cabiai	5 inch Tuyere.	B	6
584	Cabin	5½ " "	B	7
585	Cabinet	4 " "	J	27
586	Cabirean	Notch	B	31
587	Cablet	Bosh Plate	D	51
588	Cabob	" "	D	51
589	Caboose	Notch Cooler	C	40
590	Cabriolet	4½ inch Tuyere.	G	23
591	Caburn	Long Cooler	A	36
592	**Cacoa**	Notch "	C	40
593	Cachalot	6 inch Tuyere.	B	10
594	Cache	Notch	D	32
595	Cachiri	5 inch Tuyere.	B	9
596	Casholong	4 " "	B	8
597	Cachunde	Valve Seat	G	61
598	Cacodyle	5 inch Tuyere.	G	23
599	Cactus	Notch	B	31
600	Caddow	6 inch Tuyere.	B	10

INDEX—Continued.

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

No.	Cypher.	Description.	Class.	Page.
601	Caddy	Bosh Plate	G	54
602	Cadet	" "	G	54
603	Cadillac	" "	G	54
604	Cadmia	" "	G	54
605	Caduceus	" "	G	54
606	Cafenet	6 inch Tuyere	B	7
607	Cage	5 " "	B	6
608	Cagit	Bosh Plate	G	54
609	Cagmag	5½ inch Tuyere	B	9
610	Cahier	Long Cooler	A	36
611	Caimacan	7 inch Tuyere	B	11
612	Caique	Long Cooler	A	36
613	Caird	Notch "	D	41
614	Caisson	Notch	B	31
615	Caitiff	5 inch Tuyere	B	9
616	Cajeput	Bosh Plate	F	53
617	Cajoler	" "	G	54
618	Calabash	Valve Seat	C	59
619	Calade	Bosh Plate	F	53
620	Calamar	Valve Seat	C	59
621	Calamine	Long Cooler	A	35
622	Calamish	5½ inch Tuyere	B	7
623	Calamus	Notch	B	31
624	Calandra	Valve Seat	C	59
625	Calangay	Bosh Plate	C	50
626	Calash	" "	C	50
627	Calcar	" "	C	50
628	Calcimine	" "	E	52
629	Calculator	" "	E	52
630	Calculus	" "	E	52
631	Caldron	" "	E	52
632	Calender	" "	E	52
633	Calendula	" "	E	52
634	Calenture	" "	E	52
635	Calf	" "	E	52
636	Caliber	5½ inch Tuyere	B	7
637	Calico	4½ " "	A	1
638	Calidact	5 " "	F	21
639	Calin	3½ " "	A	4
640	Calipash	Notch Cooler	D	41
641	Calipee	Bosh Plate	F	53
642	Calipers	6½ inch Tuyere	B	7
643	Caliphate	Notch	B	31
644	Caliver	Bosh Plate	D	51
645	Calker	" "	D	51
646	Call	Notch	...	...
647	Caller	6 inch Tuyere	B	7
648	Calliope	Bosh Plate	D	51
649	Callus	4½ inch Tuyere	G	23
650	Calmer	Notch	...	...
651	Calomel	6 inch Tuyere	I	26
652	Caloyer	Cooler	...	...
653	Caltrap	Notch	A	30
654	Calumba	3 inch Tuyere	A	4
655	Calumbine	6 " "	B	10
656	Calumet	Bosh Plate	E	52
657	Calvary	5 inch Tuyere	J	27
658	Calville	Notch	...	...
659	Calvinist	6 inch Tuyere	B	10
660	Calycle	4½ " "	B	8
661	Calyon	Bosh Plate	D	51
662	Calyptra	Long Cooler	A	35
663	Camaieu	Bosh Plate	D	51
664	Camail	6 inch Tuyere	...	...
665	Camber	4½ " "	G	23
666	Cambist	Bosh Plate	D	51
667	Cambric	" "	E	52
668	Camel	" "	G	54
669	Camelopard	" "	G	54
670	Cameo	" "	G	54
671	Camera	" "	E	52
672	Camion	" "	D	51
673	Camisade	Notch	C	32
674	Camlet	"	C	32
675	Cammas	3 inch Tuyere	A	4
676	Cammock	4½ " "	B	6
677	Camomile	6 " "	A	3
678	Campana	5¼ " "	B	9
679	Camphene	Bosh Plate	G	54
680	Camphor	Valve Seat	A	58
681	Canakin	Long Cooler	A	35
682	Canal	5½ inch Tuyere	A	24
683	Canard	Notch Cooler	...	...
684	Canaster	Bosh Plate	D	51
685	Cancer	Short Cooler	G	34
686	Cancerite	4½ inch Tuyere	G	23
687	Canderos	Notch Cooler	C	40
688	Candidate	6 inch Tuyere	B	10
689	Candiot	5 " "	E	19
690	Canditeer	Bosh Box	A	43
691	Candle	5½ inch Tuyere	B	9
692	Candock	Notch	C	32
693	Candroy	"	A	30
694	Cane	Notch Cooler	C	40
695	Canine	6 inch Tuyere	A	1
696	Canister	Bosh Plate	E	52
697	Cannabis	5½ inch Tuyere	A	3
698	Cannibal	4 " "	G	23
699	Cannon	Short Cooler	A	34
700	Cannonade	6 inch Tuyere	B	7

700

900

INDEX—Continued.

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

No.	Cypher.	Description.	Class.	Page.
301	Blazer	5½ inch Tuyere	B	9
302	Blea	Notch	D	32
303	Bleacher	6 inch Tuyere	B	7
304	Blemish	6 " "	B	10
305	Blenny	4½ " "	A	5
306	Bletonist	5 " "	B	6
307	Bleyme	5 " "	A	5
308	Blinker	3¾ " "	A	4
309	Blister	Notch Cooler	C	40
310	Bloater	" "	B	37
311	Block	6 inch Tuyere	A	3
312	Blockade	7 " "	B	10
313	Blomary	4 " "	A	4
314	Blonde	5 " "	E	19
315	Bloomer	Long Cooler	A	36
316	Blossom	7 inch Tuyere	G	24
317	Blotter	3 " "	A	4
318	Blouse	7 " "	I	26
319	Blower	Notch	A	30
320	Bluff	6½ inch Tuyere	B	10
321	Blunder	5 " "	A	2
322	Blush	Long Cooler	A	35
323	Bluster	Notch "	D	41
324	Board	" "	B	31
325	Boarder	6 inch Tuyere	B	10
326	Boast	5½ " "	G	24
327	Boaster	Notch	A	30
328	Boaston	5½ inch Tuyere	G	24
329	Boatman	Valve Seat	C	59
330	Boatsman	Long Cooler	A	35
331	Bobbin	Notch	A	30
332	Bobbinet	5 inch Tuyere	A	2
333	Bobolink	6 " "	B	10
334	Bobtail	5½ " "	B	9
335	Bocal	5 " "	B	9
336	Bocasine	Notch	B	31
337	Bochelet	6½ inch Tuyere	G	24
338	Bockey	Notch	A	30
339	Bodice	6 inch Tuyere	B	10
340	Bodle	6 " "	...	...
341	Bohea	5 " "	A	2
342	Boiarin	Notch	A	30
343	Boiler	6 inch Tuyere	B	7
344	Bolis	5 " "	G	23
345	Bollard	7 " "	B	10
346	Bolster	Valve Seat	...	...
347	Boltonite	Notch Cooler	D	41
348	Bomb	Short "	A	34
349	Bombate	5 inch Tuyere	C	12
350	Bombyx	6 " "	C	15
351	Bonasus	Short Cooler	A	34
352	Bonbon	Notch	A	30
353	Bondue	7 inch Tuyere	A	3
354	Bonfire	Long Cooler	A	35
355	Bonito	3 inch Tuyere	B	11
356	Bonnet	6 " "	E	19
357	Bonten	6 " "	B	10
358	Booley	4½ " "	A	5
359	Boomerang	6 " "	B	10
360	Booser	6 " "	B	7
361	Bootel	6 " "	G	24
362	Booth	Notch Cooler	D	42
363	Boracite	Bosh Plate	A	47
364	Borate	4½ inch Tuyere	A	5
365	Border	Long Cooler	A	35
366	Boreas	" "	A	36
367	Borough	Notch "	C	40
368	Boruret	5 inch Tuyere	E	19
369	Boscage	4 " "	G	23
370	Bosset	5 " "	G	23
371	Botanist	Notch	A	30
372	Botargo	7 inch Tuyere	G	24
373	Botch	Bosh Box	A	43
374	Bottle	4½ inch Tuyere	I	26
375	Bottom	Short Cooler	A	34
376	Boudoirs	6½ inch Tuyere	A	1
377	Bough	5 " "	B	9
378	Bouncer	5 " "	B	11
379	Boundary	Notch Cooler	D	41
380	Bounty	Long "	A	36
381	Bouquet	Notch	C	32
382	Bourse	6 inch Tuyere	I	26
383	Bovate	Cooler	B	37
384	Bowlder	Notch Cooler	D	41
385	Bowline	6 inch Tuyere	G	24
386	Boxer	4 " "	A	4
387	Boyar	Notch	B	31
388	Boyuna	Valve Seat	E	60
389	Bracelet	Bosh Box	C	45
390	Bracket	6 inch Tuyere	C	15
391	Brad	Notch	...	...
392	Braggart	"	...	...
393	Braid	Long Cooler	A	35
394	Brake	" "	A	35
395	Bramble	" "	A	36
396	Branch	Bosh Box	A	43
397	Brancher	Long Cooler	A	35
398	Brand	5½ inch Tuyere	B	7
399	Brander	Cooler	B	37
400	Brandrith	Bosh Plate	A	47

INDEX—Continued.

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

No.	Cypher.	Description.	Class.	Page.
401	Braulin	Bosh Plate	A	47
402	Brash	" "	A	47
403	Brassart	" "	A	47
404	Bray	" "	A	47
405	Brayer	" "	A	47
406	**Brasier**	Short Cooler	A	34
407	Breach	7 inch Tuyere	G	24
408	Bread	Notch	...	...
409	Breaker	6 inch Tuyere	B	7
410	Bream	Notch	A	30
411	Breather	6 inch Tuyere	C	15
412	Breccia	Valve Seat	F	60
413	Breeder	Valve	A	63
414	Brehon	Valve Seat	F	60
415	Brennage	Valve	A	63
416	Brent	2½ inch Tuyere	D	18
417	Breton	Notch	A	30
418	Brettice	Valve Seat	G	61
419	Bretzel	Long Cooler	A	35
420	Brevet	Bosh Plate	A	47
421	Brevier	" "	A	47
422	Breviped	" "	A	47
423	Brewer	" "	A	47
424	Brew's	Valve Seat	G	61
425	Bribe	5 inch Tuyere	I	26
426	Brick	Long Cooler	A	36
427	Brickbat	Notch "	C	40
428	Bricole	Bosh Box	C	45
429	Bridge	4½ inch Tuyere	A	5
430	Bridler	6 " "	B	10
431	Bridoom	Long Cooler	A	35
432	Brief	Bosh Box	A	43
433	Brigade	7 inch Tuyere	G	24
434	Brigand	7 " "	F	22
435	Brigantine	Long Cooler	A	35
436	Brill	Cooler	B	37
437	Brilliant	Valve Seat	C	59
438	Brimmer	" "	E	60
439	Brimstone	7 inch Tuyere	B	7
440	Brindle	6 " "	G	24
441	Bringer	6 " "	...	...
442	Brisket	Valve Seat	...	...
443	Bristle	Long Cooler	A	35
444	Brisure	6½ inch Tuyere	B	10
445	Britannia	6 " "	B	7
446	Briton	3¼ " "	A	2
447	Broach	6 " "	B	10
448	Broacher	Long Cooler	A	35
449	Brocade	5 inch Tuyere	C	14
450	Brocket	7 " "	B	10
451	Brodekin	Bosh Plate	C	50
452	Brogan	" "	C	50
453	Broiler	" "	C	50
454	Broker	" "	C	50
455	Broma	" "	C	50
456	Bromate	" "	C	50
457	Bromide	" "	C	50
458	Bromuret	" "	C	50
459	Brond	Notch Cooler	D	41
460	Brontern	" "	D	41
461	Bronzist	Short "	A	34
462	Brooch	Bosh Plate	A	47
463	Brook	Long Cooler	A	35
464	Brooklet	Notch "	C	40
465	Brooklime	6 inch Tuyere	A	1
466	Brookmint	6 " "	B	7
467	Brookweed	Long Cooler	A	35
468	Brose	Notch	C	32
469	Brother	4 inch Tuyere	B	6
470	Brougham	Short Cooler	A	34
471	Brownie	5½ inch Tuyere	F	21
472	Browse	Notch Cooler	D	42
473	Brucina	Long "	A	36
474	Bruise	6 inch Tuyere	B	7
475	Brume	Notch Cooler	C	40
476	Brunette	" "	B	37
477	Brunion	" "	C	40
478	Brush	Notch	A	30
479	Brusher	Notch Cooler	C	40
480	Brute	Notch	A	30
481	Bryonine	5½ inch Tuyere	B	11
482	Bryony	Short Cooler	A	34
483	Bubble	Bosh Plate	A	47
484	Buccan	" "	A	47
485	Buccaneer	" "	A	47
486	Bucket	" "	A	47
487	Buckeye	Valve Seat	B	58
488	Buckler	Long Cooler	A	35
489	Buckra	Notch	C	32
490	Buckskin	Valve Seat	D	59
491	Buddhist	5½ inch Tuyere	B	9
492	Budge	Valve Seat	C	59
493	Budger	Bosh Plate	F	53
494	Budlet	" "	F	53
495	Buffalo	" "	G	54
496	Buffer	" "	D	51
497	Buffeter	" "	D	51
498	Buffin	" "	D	51
499	Buffoon	" "	D	51
500	Buggy	Notch Cooler	G	40

500

700

900

INDEX—Continued.

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

No.	Cypher.	Description.	Class.	Page.
101	Bagman	6 inch Tuyere	B	10
102	Bagnet	Long Cooler	A	35
103	Bagnio	5½ inch Tuyere	B	9
104	Bagpipe	5 " "	B	6
105	Bahar	3 " "	B	8
106	Bail	4 " "	A	4
107	Bailer	5 " "	G	23
108	Bailiff	2½ " "	A	2
109	Bairn	5½ " "	C	13
110	Bait	3½ " "	A	4
111	Baize	4½ " "	D	18
112	Baker	Short Cooler	A	34
113	Balance	4 inch Tuyere	F	20
114	Balcony	6 " "	B	10
115	Bale	5 " "	B	9
116	Baleen	4½ " "	G	23
117	Balk	4 " "	A	4
118	Ballad	3½ " "	F	20
119	Ballast	7 " "	B	10
120	Ballet	4 " "	B	8
121	Ballister	4 " "	A	1
122	Balloon	6½ " "	G	24
123	Ballow	5 " "	B	9
124	Balm	4½ " "	G	23
125	Balsam	Long Cooler	A	35
126	Ban	5 inch Tuyere	C	12
127	Banana	3½ " "	A	2
128	Banco	3½ " "	C	14
129	Band	4½ " "	A	2
130	Bandage	4 " "	B	8
131	Bandana	2½ " "	D	18
132	Bandbox	4½ " "	B	8
133	Bander	4½ " "	B	8
134	Bandit	4 " "	B	8
135	Bandle	5 " "	B	6
136	Bandog	4 " "	G	23
137	Bandoleer	Valve seat	B	58
138	Bandoline	5½ inch Tuyere	C	15
139	Bane	3 " "	B	8
140	Bang	4 " "	E	19
141	Bangle	4½ " "	B	8
142	Batrian	4½ " "	D	18
143	Banisher	4 " "	A	1
144	Banjo	3½ " "	B	8
145	Bank	Long Cooler	A	35
146	Banker	6½ inch Tuyere	C	15
147	Bankrupt	2½ " "	A	4
148	Banner	5 " "	F	21
149	Bannock	4 " "	C	14
150	Banquet	Notch	A	30
151	Banshee	3 inch Tuyere	F	20
152	Bantam	4 " "	B	6
153	Baptist	Bosh Plate	A	47
154	Bar	" "	A	47
155	Barb	4½ inch Tuyere	F	20
156	Barbacan	5 " "	B	9
157	Barbarian	4 " "	D	18
158	Barbecue	Long Cooler	A	35
159	Barber	6 inch Tuyere	B	11
160	Barcon	6½ " "	B	10
161	Barfee	4 " "	A	4
162	Bargain	3 " "	A	4
163	Barker	4½ " "	E	19
164	Barley	Long Cooler	A	36
165	Barnacle	5 inch Tuyere	B	9
166	Barometer	3½ " "	B	8
167	Baron	Notch	C	32
168	Baronet	4½ inch Tuyere	A	5
169	Baroscope	4 " "	B	8
170	Barrack	3½ " "	D	18
171	Barrel	4½ " "	B	8
172	Barrier	4 " "	F	20
173	Barrow	Short Cooler	A	34
174	Barse	5 inch Tuyere	G	23
175	Barter	4½ " "	E	19
176	Baritzan	3½ " "	A	1
177	Barton	4½ " "	C	14
178	Bartram	3 " "	F	20
179	Barytone	5½ " "	B	7
180	Basalt	6½ " "	B	11
181	Basanite	4 " "	B	8
182	Base	4½ " "	A	1
183	Basement	4½ " "	A	5
184	Bashaw	3½ " "	B	8
185	Basil	4½ " "	B	6
186	Basinet	6½ " "	B	10
187	Basket	3½ " "	F	20
188	Baslard	4½ " "	B	8
189	Basque	5 " "	A	2
190	Basset	Notch	A	30
191	Bassoon	Long Cooler	A	35
192	Bastile	Notch	C	32
193	Bastion	Long Cooler	A	35
194	Bat	Notch	C	40
195	Batch	4 inch Tuyere	A	1
196	Bather	4 " "	D	18
197	Batlet	Notch Cooler	C	40
198	Batman	" "	C	40
199	Batter	Valve Seat	B	58
200	Battle	" "	C	59

INDEX—Continued.

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

No.	Cypher.	Description.	Class.	Page.
201	Batton	5½ inch Tuyere	B	9
202	Batz	6 " "	B	10
203	Baubee	6½ " "	F	22
204	Baudkin	7 " "	F	22
205	Baulk	Long Cooler	A	35
206	Bavarian	3 inch Tuyere	B	6
207	Bavaroy	4½ " "	A	1
208	Bawble	5 " "	D	18
209	Bawd	5 " "	A	1
210	Bawler	4 " "	G	23
211	Bay	Notch	A	30
212	Bayonet	6 inch Tuyere	B	11
213	Bazar	5½ " "	F	21
214	Beach	6 " "	F	22
215	Beacon	Cooler	F	38
216	Bead	6 inch Tuyere	F	22
217	Beadle	5 " "	F	21
218	Beaker	6 " "	C	13
219	Beamlet	5 " "	G	23
220	Bear	4½ " "	C	12
221	Bearer	Bosh Box	A	43
222	Beast	" "	A	43
223	Beater	6½ inch Tuyere	F	22
224	Beaufet	4½ " "	C	14
225	Beaufin	5 " "	C	14
226	Beauty	5½ " "	C	15
227	Beaver	5 " "	F	21
228	Beck	Valve Seat	C	59
229	Becket	" "	C	59
230	Beckon	6 inch Tuyere	A	3
231	Bedder	7 " "	A	3
232	Bedlem	Notch	C	32
233	Bedouin	4½ inch Tuyere	C	12
234	Bedroom	5 " "	B	6
235	Bedstead	5 " "	A	5
236	Bee	Notch	A	30
237	Beech	Notch Cooler	D	42
238	Beetle	" "	D	42
239	Beggar	Short Cooler	A	34
240	Beginner	" "	A	34
241	Beguiler	Notch "	D	41
242	Beholder	6 inch Tuyere	F	22
243	Belemnite	5 " "	I	26
244	Belfry	6 " "	F	22
245	Belgian	3½ " "	C	14
246	Belial	4 " "	B	6
247	Belief	Notch	C	32
248	Believer	5 inch Tuyere	A	2
249	Bell	Notch Cooler	D	41
250	Belone	4½ inch Tuyere	I	26
251	Beluga	6½ inch Tuyere	C	15
252	Bema	4½ " "	E	19
253	Bench	Long Cooler	A	35
254	Bencher	Notch "	C	40
255	Bender	7 inch Tuyere	A	5
256	Benedict	4½ " "	G	23
257	Benefit	6 " "	A	5
258	Bengal	Cooler	B	37
259	Bennet	6 inch Tuyere	G	24
260	Benzine	5 " "	F	21
261	Bergamot	Notch	C	32
262	Bergmote	5½ inch Tuyere	A	1
263	Berlin	5 " "	A	5
264	Berme	5 " "	B	9
265	Berry	6 " "	F	22
266	Beryl	Bosh Box	A	43
267	Besieger	" "	A	43
268	Betuline	" "	A	43
269	Beverage	6 inch Tuyere	B	10
270	Bias	3 " "	A	4
271	Biceps	6 " "	A	5
272	Bicker	Cooler Ring	...	...
273	Bidder	Long Cooler	A	35
274	Bifer	Bosh Plate	A	47
275	Biffin	" "	A	47
276	Bigamist	" "	A	47
277	Bigot	" "	A	47
278	Bijou	" "	A	47
279	Bilalo	" "	A	47
280	Billot	6 inch Tuyere	F	22
281	Binder	Bosh Box	A	43
282	Binnacle	5½ inch Tuyere	A	5
283	Binot	5 " "	A	5
284	Biped	Long Cooler	A	36
285	Birch	Cooler Ring	...	...
286	Birrus	Bosh Jacket	...	46
287	Biscotin	" "	...	46
288	Biscuit	" "	...	46
289	Bishop	" "	...	46
290	Bison	Notch Cooler	C	40
291	Bistort	Long "	A	36
292	Biter	6 inch Tuyere	B	10
293	Bittern	Notch	D	32
294	Blackball	Notch Cooler	D	41
295	Blackbird	4 inch Tuyere	G	23
296	Blackcap	7 " "	B	7
297	Blackleg	3 " "	B	8
298	Blade	5 " "	F	21
299	Blank	Valve Stem	...	...
300	Blanket	Valve Seat	A	58

300

500

700

900

TELEGRAPH CYPHER.

FOR INQUIRY AFTER, AND PURCHASING, BRONZE TUYERES, COOLERS, NOTCHES, BOSH PLATES, ETC.

..... will send particulars by mail.

Stella .....

ANSWERS TO QUERIES AND ORDERS.

Adam.....Your order was shipped by express ..... inst.
Albert .....Your order was shipped by rail (freight) ..... inst.
Charles.....Have suspended shipment of order of ..... inst.
Daniel.....Have suspended work on order of ..... inst.
Edward..... Order received, shipped same to-day by express.
George.....Order received, shipped same to-day by freight.
Harvey ....Order received, will ship ..... inst.
Henry.....Order received, see letter for specifications.
Howard .....We can ship in ..... days from receipt of order.
James.....We have in stock and can furnish at once
John..... ...We can furnish at ..... cents per lb.
Paul .....We have none in stock, but will make and ship by ..... inst.
Frank.....Please reply immediately by telegraph.
Ralph.....Have sent particulars by mail.
Robert.....

LONG DISTANCE TELEPHONE.

Telegraph and Telephone MESSAGES receive PROMPT ATTENTION at ***all hours***, day and ***NIGHT***.

Cable address, "BESTFOX," PITTSBURG.

INDEX

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

TEL. CYPHER

No.	Cypher.	Description.	Class.	Page.
1	Abacus	5 inch Tuyere	A	5
2	Abandon	5½ " "	B	9
3	Abatis	6¾ " "	C	15
4	Abbey	7 " "	B	10
5	Abbot	4½ " "	B	8
6	Abhal	5 " "	B	9
7	Abnet	7 " "	H	25
8	Abode	6 " "	H	25
9	Aboma	Notch	H	25
10	Abcess	6½ inch Tuyere	B	10
11	Abstract	6 " "	B	10
12	Abyss	5½ " "	A	3
13	Acacia	3 " "	A	2
14	Access	4 " "	A	2
15	Account	4½ " "	A	2
16	Acid	5 " "	A	2
17	Acorn	5 " "	A	5
18	Acre	2½ " "	A	4
19	Actor	3½ " "	A	4
20	Actress	4 " "	A	4
21	Adamite	3 " "	A	4
22	Adder	7 " "	G	24
23	Adept	6 " "	G	24
24	Admiral	5½ " "	G	24
25	Adult	5 " "	B	9
26	Adz	Bosh Plate	A	47
27	Affix	" "	A	47
28	Agate	" "	A	47
29	Agent	3 inch Tuyere	D	18
30	Aisle	4 " "	D	18
31	Album	4½ " "	D	18
32	Alcove	5 " "	D	18
33	Alder	5 " "	D	18
34	Alien	6½ " "	B	11
35	Alley	6 " "	B	11
36	Almond	5½ " "	B	11
37	Aloe	5 " "	B	9
38	Alpaca	Bosh Box	A	43
39	Altar	Valve Seat	A	58
40	Ament	4 inch Tuyere	F	20
41	Anchor	4½ " "	F	20
42	Ancient	5 " "	F	21
43	Andiron	5½ " "	F	21
44	Angel	6 " "	F	22
45	Angler	6½ " "	F	22
46	Animal	7 " "	F	22
47	Ankle	6 " "	F	22
48	Annual	Notch	C	32
49	Anthem	"	...	...
50	Antidote	"	C	32
51	Antique	Notch	C	32
52	Anvil	Long Cooler	A	35
53	Ape	Cooler	F	38
54	Apostate	Long Cooler	A	35
55	Apple	" "	A	36
56	Apricot	" "	A	36
57	Apron	Round Bosh Box	C	45
58	Arch	Hearth Jacket	...	46
59	Arena	7 inch Tuyere	B	11
60	Armada	6 " "	A	3
61	Armor	5½ " "	A	3
62	Arrow	4 " "	B	8
63	Arsenal	3½ " "	A	2
64	Artist	Bosh Plate	...	...
65	Asp	Long Cooler	A	35
66	Atlas	Valve Seat	C	59
67	Attic	5 inch Tuyere	C	14
68	Auction	5 " "	C	14
69	Augur	Notch Cooler	C	40
70	Aunt	Notch	C	32
71	Arthur	5 inch Tuyere	E	19
72	Avenger	6 " "	C	13
73	Avenue	6 " "	C	15
74	Average	5 " "	H	25
75	Awl	3½ " "	A	4
76	Awning	4 " "	A	4
77	Axle	5½ " "	G	24
78	Aztec	6 " "	G	24
79	Baal	Cooler	F	38
80	Babble	Cinder Dam	...	...
81	Babe	Valve Seat	A	58
82	Babel	5 inch Tuyere	B	6
83	Bablah	Short Cooler	A	34
84	Baboon	" "	A	34
85	Bac	4 inch Tuyere	B	11
86	Bacca	4½ " "	B	11
87	Bacchus	4½ " "	A	1
88	Bachelor	4½ " "	A	5
89	Backbone	5½ " "	B	7
90	Backer	6 " "	B	7
91	Backset	4½ " "	A	5
92	Bacon	Notch	D	32
93	Bacule	Valve Seat	A	58
94	Baculite	5 inch Tuyere	B	9
95	Badge	5 " "	E	19
96	Badian	Bosh Plate	...	...
97	Baftas	Notch	C	32
98	Baffle	4 inch Tuyere	A	2
99	Bag	5 " "	A	1
100	Baggage	5 " "	G	23

100 300 500 700 900

TELEGRAPH CYPHER.

FOR INQUIRY AFTER, AND PURCHASING, BRONZE TUYERES, COOLERS, NOTCHES, BOSH PLATES, ETC.

QUERIES AND ORDERS.

Addie.....Ship immediately by express.
Alice.....Ship immediately by rail (freight).
Carrie.....Suspend shipment of order of ..... inst.
Clara.....Suspend work on order of ..... inst., until further instructions.
Ella.....Letter received, make as you specify therein.
Emma.....Letter received, cannot use with alterations mentioned.
Jane.....How soon can you furnish .....?
Lizzie.....Have you in stock, and can you furnish .....?
Maggie.....At what price can you furnish .....?
Mary.....At what price and how soon can you furnish .....?
Maud.....When can you ship .....?
Nellie.....Have you shipped order of ..... inst.?
Frank.....Please reply immediately by telegraph.
Sarah.....Will send particulars by mail.
Stella.....

ANSWERS TO QUERIES AND ORDERS.

Adam.....Your order was shipped by express ..... inst.
Albert.....Your order was shipped by rail (freight) ..... inst.
Charles.....Have suspended shipment of order of ..... inst.
Daniel.....Have suspended work on order of ..... inst.
Edward..... Order received, shipped same to-day by express.
George.....Order received, shipped same to-day by freight.
Harvey.....Order received, will ship ..... inst.
Henry.....Order received, see letter for specifications.
Howard.....We can ship in ..... days from receipt of order.
James.....We have in stock and can furnish at once
John.....We can furnish at ..... cents per lb.
Paul.....We have none in stock, but will make and ship by ..... inst.
Frank.....Please reply immediately by telegraph.
Ralph.....Have sent particulars by mail.
Robert.....

LONG DISTANCE TELEPHONE.

Telegraph and Telephone MESSAGES receive PROMPT ATTENTION at ***all hours***, day and ***NIGHT***.

Cable address, "BESTFOX," PITTSBURG.

INDEX

For Bronze Tuyeres, Coolers, Notches, Bosh Plates and Boxes, Valve Seats, Etc.

TEL. CYPHER

No.	Cypher.	Description.	Class.	Page.
[illegible]	Antique	Notch	C	32

100

SPECIAL NOTICE.

Please DESTROY on Receipt of this Catalogue, any TELEGRAPH CYPHERS sent by us that you may have.

300

500

700

900

No.	Cypher.	Description.	Class.	Page.
21	Adamite	[illegible]		
22	Adder	7 " "	G	24
23	Adept	6 " "	G	24
24	Admiral	5½ " "	G	24
25	Adult	5 " "	B	9
26	Adz.	Bosh Plate	A	47
27	Affix	" "	A	47
28	Agate	" "	A	47
29	Agent	3 inch Tuyere	D	18
30	Aisle	4 " "	D	18
31	Album	4½ " "	D	18
32	Alcove	5 " "	D	18
33	Alder	5 " "	D	18
34	Alien	6½ " "	B	11
35	Alley	6 " "	B	11
36	Almond	5½ " "	B	11
37	Aloe	5 " "	B	9
38	Alpaca	Bosh Box	A	43
39	Altar	Valve Seat	A	58
40	Ament	4 inch Tuyere	F	20
41	Anchor	4½ " "	F	20
42	Ancient	5 " "	F	21
43	Andiron	5½ " "	F	21
44	Angel	6 " "	F	22
45	Angler	6½ " "	F	22
46	Animal	7 " "	F	22
47	Ankle	6 " "	F	22
48	Annual	Notch	C	32
49	Anthem	"	...	...
50	Antidote	"	C	32
73	Avenue	6 " "	C	15
74	Average	5 " "	H	25
75	Awl	3½ " "	A	4
76	Awning	4 " "	A	4
77	Axle	5½ " "	G	24
78	Aztec	6 " "	G	24
79	Baal	Cooler	F	38
80	Babble	Cinder Dam	...	...
81	Babe	Valve Seat	A	58
82	Babel	5 inch Tuyere	B	6
83	Bablah	Short Cooler	A	34
84	Baboon	" "	A	34
85	Bac	4 inch Tuyere	B	11
86	Bacca	4½ " "	B	11
87	Bacchus	4½ " "	A	1
88	Bachelor	4½ " "	A	5
89	Backbone	5½ " "	B	7
90	Backer	6 " "	B	7
91	Backset	4½ " "	A	5
92	Bacon	Notch	D	32
93	Bacule	Valve Seat	A	58
94	Baculite	5 inch Tuyere	B	9
95	Badge	5 " "	E	19
96	Badian	Bosh Plate	...	...
97	Baftas	Notch	C	32
98	Baffle	4 inch Tuyere	A	2
99	Bag	5 " "	A	1
100	Baggage	5 " "	G	23

INDEX.—CONTINUED.

PAGE.

D.

Dam Plates, Iron 88

E.

Elbows, Union 100
Engine Bearings 102
Eye Sight, Stove 100

F.

Feeder, Medicine 90, 91
Fitting, Bosh 94–97
Fronheiser Bosh Boxes 70–73
" Medicine Feeder 90, 91
Funnels 100
Furnace Bell Cylinder 101

G.

Gas Burners 105
Gayley Bosh Plates 80, 81
Goose Necks 100

H.

Hearth Jacket, Bronze 46
" " Steel 103

PAGE.

Hose Nipples 100
" Wire Wrapped 101
Hot Blast Valves 103
Hunt Jacket or Plate 76, 77

I.

Iron Coolers 89
" Plates, Bosh, Jacket, etc 88
" Tuyeres 89

J.

Jacket Coils 89
Jackets, Hearth and Bosh 46
" Hunt 76, 77
" Plates, Iron 88
" Steel Hearth 102

K.

Kennedy Bosh Plates 68, 69
" Repairs 82, 83
Keystone Unions 100

M.

Malleable Unions 100
Manifold 90–92
Medicine Feeder 90, 9

INDEX.—CONTINUED.

PAGE.

N.

Nipple, Hose 100
Notch Coolers 40–42
" Plate 88
Notches, Cinder. Tables 26, 30–33

P.

Pipe, Belly or Blow 93
" Circular 90
" Combination 90
Plates, Bosh, Tables 47–55
" Fronheiser 70–73
" Gayley 80, 81
" Hunt 76, 77
" Iron, Bosh, Jackets, etc 88
" Pollock 72–75
" Scott 78, 79
Pollock Plates 72–75
Plugs, Brass 102

R.

Relief Valves, Air 104
Repairs, Kennedy 82, 83
Rod, Copper 102
Rope, Wire 101

S.

Scott Plates 78, 79
Seats, Valve 58–62

PAGE.

Spray Pipe 86, 87
Steel Hearth Jackets 102
Stove Burners 105
Stove Eye Sights 100

T.

Tee, Union 100
Trough 90
Tuyere Cocks 98, 99
" Stocks 93
Tuyeres, Tables 1–29
" Iron 89

U.

Unions, Iron and Brass 100
Universal Unions 100

V.

Valve Seats 58–62
Valves 63
" Chimney 104
" Cold Blast 104
" Air Relief 104
" Hot Blast 103

W.

Waste Trough 90
Wire Rope 101
Wire Wrapped Hose 101

100

300

500

700

900

TRADE MARK.

CABLE ADDRESS *"BESTFOX"* PITTSBURGH.

LONG - - - DISTANCE

TELEPHONE PITTSBURGH.

DIRECT COMMUNICATION TO ALL POINTS.

TELEPHONE AND TELEGRAPH MESSAGES

RECEIVE PROMPT ATTENTION AT

ALL HOURS, DAY AND NIGHT.

COPYRIGHTED 1894.

PRESS OF J. B. SAVAGE,
CLEVELAND, O.

CATALOGUE F.

INDEX.

PAGE.

A.

Air Relief Valves 104

B.

Bands, Bosh 90
Bearings, Brass or Bronze 102
Bell Cylinder 101
Belly or Blow Pipes 93
Blast Valves, Cold 104
" " Hot 103
Blow Pipes 93
Boiler Burner 105
Boring Cylinders 106
Bosh Bands 90
" Boxes, Tables 43–45
" Burned Out 84, 85
" Fitting 94–97
" Jacket 46
" Plates, Tables 47–55
" " Fronheiser 70–73
" " Gayley 80, 81
" " Hunt 76, 77
" " Iron 88
" " Kennedy 68, 69
" " Pollock 72–75
" " Scott 78, 79
Boxes, Fronheiser Bosh 70–73
Brass Cocks 98

PAGE.

Brass Plugs 102
" Unions 100
Brasses 102
Burners, Gas 105

C.

Car Brasses 102
Chimney Valves 104
Cinder Notches, Tables 26, 30–33
" " in combination 89
Circular Coil or Pipe 90
Cocks, Brass 98
" Iron 101
" Tuyere 98, 99
Cold Blast Valves 104
Coils, Circular 90
" Jacket or Tuyere 89
Combination Pipe 90
Combinations 89
Cooler Jacket Plates 88
Coolers, Tables 34–39
" Iron 89
" Notch, Description .....
" " Tables 40–42
" " in combination 89
Copper Rod 102
Countersunk Plugs, Brass 102
Cylinders, Bell 101
" Boring 106

TEL. CYPHER

100

300

500

700

900

ESTABLISHED 1884.

BEST, FOX & CO.,

TEL. CYPHER

BRASS FOUNDERS, IRON PIPE FITTERS

AND

MACHINISTS

100

SOLE MANUFACTURERS

OF

CLIMAX BRONZE TUYERES, COOLERS, NOTCHES,

300

BOSH PLATES AND BOXES,

VALVES AND SEATS.

ROLLING MILL, ENGINE, LOCOMOTIVE AND CAR BEARINGS,

500

ALSO

MANUFACTURERS OF AND DEALERS IN

LIBRARY OF CONGRESS COPYRIGHT APR 3 1895 CITY OF WASHINGTON.

PIPE, VALVES, FITTINGS & SUPPLIES

38868

FOR STEAM, WATER AND GAS.

700

OFFICE AND WORKS,

TWENTY-FIFTH, RAILROAD STS. & ALLEGHENY RIVER,

PITTSBURGH, PA., U. S. A.

900

1894.

CATALOGUE F.

TEL.
CYPHER

100

300

500

700

900

REGISTER No. 2138

LIBRARY OF CONGRESS.
Chap. Copyright No.
Shelf TS285
B56
UNITED STATES OF AMERICA.
1894-F

TEL.
CYPHER

100

300

500

700

900

BEST, FOX & CO.

PITTSBURGH, PA.

Blast Furnace Specialties.